BELL TELEPHONE MAGAZINE

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  Progress at Andover
- Communications Unlimited For Colleges and Universities

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BELL TELEPHONE MAGAZINE

A non-technical review, published quarterly to give Bell System management people a broader view of the history, objectives, operations, and achievements of this business than they might attain in the course of their day-to-day occupations, and an added sense of participation in the problems and accomplishments of our nation-wide public service.

COVER: The design, incorporating drawings suggested by articles in this issue, was done by Salvatore Giglio, A. T. & T. staff artist.

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A MEDIUM OF SUGGESTION and A RECORD OF PROGRESS

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Bell System management people have visited over a quarter of a million individual share owners in recent years. The mutual benefits derived from these visits have exceeded all expectations

Getting To Know Our Share Owners

Allen G. Barry, *Vice President and Secretary*, A. T. & T. CO.

THERE ARE nearly 20,000 people in the picture on these pages. As owners of American Telephone and Telegraph Company stock, they represent the largest number of share owners ever to assemble for a corporation's annual meeting.

Their main reason for coming, many of them from great distances, was that, as owners of A. T. & T. stock, they wanted to join personally in the affairs of the business in which they had invested their money. They came to see the directors and officers and to hear Mr. Kappel report to them on the state of the business and plans for the future. They came to present their views to him or listen as others did so. In short, they came to learn more about their Company.

Despite the size of our Annual Meetings, a considerable amount of two-way exchange of information takes

Last year's *annual meeting showing a large portion of the 20,000-plus share owners who attended.*

place. At the 1961 meeting the question-and-answer period continued for more than three hours.

Of course, all business needs the understanding and confidence of those who own it, those who serve it, and those whom it serves. And this is especially true of our business. For, by its very nature, it penetrates the everyday life of our nation and more and more reaches out to the rest of the world. As we seek to meet the increasingly diversified communications needs of the home, and of industry and government, we shall need an even greater interest and knowledge among the owners of our business.

Mr. Kappel has said that, if it were humanly possible, he would like to meet all of A. T. & T.'s more than two million share owners and hear firsthand their questions, opinions, suggestions and criticisms, and give them directly the information they want and need. But, since the sheer number of people makes such face-to-face meetings impractical, we have developed other ways of communicating with share owners.

Keeping Share Owners Informed

Besides the Annual Meeting, share owners are kept informed about the business by the Report of the Annual Meeting, the Annual Report, the Share Owners' Quarterly, by advertising and by press statements issued by the Company. Since the Company's activities are news, newspapers and magazines as well as radio and television give space and time to reporting developments in our business. In addition, a goodly number of share owners write Mr. Kappel and other A. T. & T. officers to ask questions, to express approval, to offer suggestions or assistance, or to get facts about facets of the business in which they are particularly interested.

Each of these ways of keeping our share owners informed serves its purpose and serves it well. The written word, however, has inadequacies. It provides, usually, one-way communication—from the Company to the owner. It does not provide the opportunity to discuss or delve thoroughly into the aspects of the business that are of specific concern to the individual.

In the mass media there is a further limitation. Newspapers, magazines, radio and TV are confined in space and time and cannot always present the Company's position in full.

The Chance To Discuss

It becomes quite clear then, that to have a well-rounded understanding of the Company's endeavors, share owners need a good deal of information. And they need the chance to bring up

If *it were humanly possible, Mr. Kappel would like to meet all of A. T. & T.'s more than two million share owners.*

Over *a quarter of a million share owners have been visited to date under the share owner-management visit program.*

questions that may come to mind from something they have read or heard.

For as many years as the Bell System has been in business, management people have visited customers and share owners concerning matters which could best be handled by personal discussions. Invariably, these face-to-face talks have developed a measure of mutual understanding and confidence that would not have been possible from written communications alone.

Until a few years ago, the number of visits with share owners was relatively small. These visits proved so worthwhile, however, that about seven years ago the Companies agreed to undertake a planned Share Owner-Management Visit program designed to increase the number of share owner visits throughout the Bell System. Since then, more than a quarter of a million share owners, selected on a random basis, have been visited. In numbers they represent more than three times the total attendance at all the Annual Meetings which have been held since our Company was founded.

Results Exceed Expectations

The mutual benefits flowing from these share owner-management visits have turned out to be even more significant than could have been anticipated when they were undertaken.

First, let's look at some of the benefits to share owners. They have a wide range of interests in the affairs of the Company. They ask about earnings, growth, construction and the long term prospects of the business. They are concerned about higher taxes; they have questions about telephone service; they are interested in new developments and our plans for new products. Interviewers give them prompt and detailed answers to their questions. In these face-to-face discussions it is possible to deal directly with the individual's special interests and questions, obtain reactions, and gain a mutual understanding.

A Warm Response

Share owners respond warmly to the visits and speak their minds. Visits are a clear indication that the Company regards share owners as people of importance to the business, not just numbers on stock certificates. As a matter of pride, share owners want to be able to answer questions about the business that come up in conversations with their friends and acquaintances.

Many share owners bring up questions or seek solutions to special problems relating to ownership of stock or telephone service. In some instances they have never had the opportunity to ask or, as is more frequently the case, were not quite sure to whom their questions or problems should have been referred.

Bell System plans for satellite communications have captured the imagi-

nation of share owners. When they discuss them with us, they do so with considerable pride at having a part in seeking to open these new communications horizons. They secure additional facts that give them a better understanding of the future of communications. Many ask how they can help.

Some Reactions

But let's see from some actual reports how share owners react to these visits:

"I feel so important to think that the company would have you visit me as a share owner—I own so little stock. I always felt businesses never even thought of the little share owner. Only a company like A. T. & T. would think of visiting its share owners. . . ."

"Mr. M— is president of a large company. He asked all about our visit program and said, 'At our next directors meeting I'm going to propose we begin visiting *our* stockholders.' . . ."

"I've enjoyed this visit more than I can say. What a neighborly thing to do! . . ."

"To me this is another indication that Bell System management is foresighted and progressive. . . ."

"'This is such a very fine customer relations gesture to call on shareowners. A. T. & T. seems *so* large and *so* remote,' she exclaimed. 'It makes it so much more personal to have a representative call.' She went on to say that she felt more of this human interest approach is needed in big business today."

"Several times he expressed thanks and appreciation for my visit and is glad he 'is not just a name on the books.'"

"Mr. R— is a member of the board of the "blank" Company. He said that, in his opinion, visits like this are just another example of the Bell System's progressive attitude."

Now, let's consider how our business benefits. First of all, it's evident that share owner-management visits engender understanding, and this fosters confidence and instills in our share owners a desire to support the major aims of the business.

While it is natural to assume that share ownership per se indicates confidence and support, it is realistic to recognize that this is not always so. To some share owners a corporation is a gigantic legalistic entity, in a far off city, so preoccupied with its own affairs that it has little time or thought for those whose savings sustain its life. Visits from friendly and informed

Face to face *talks have developed a measure of mutual understanding and confidence not otherwise possible.*

Visits *are a clear indication that the Company regards share owners as people not just numbers on stock certificates. Share owners respond warmly to visits and speak their minds.*

home-town management people make it difficult for such an impression to persist.

Valuable Suggestions

Of special value to us are the comments and suggestions share owners give us about their telephone service. Within the business, we constantly measure the quality of service. And the results tell Bell System employees how their company, their department, their area, their division, their district and even their group is measuring up to exacting standards.

But there is an even more important measurement. It is the degree of acceptance and satisfaction expressed by our customers. If they are not satisfied, it matters little that our within-the-business measurements show our service to be technically excellent. And so the Bell Companies are evaluating their services from their customers' point of view and taking corrective action when and where dissatisfactions are found.

Visits with share owners give the companies fresh, day-to-day information on their views as customers. Those who make the visits are trained to be sensitive to these views, to report them faithfully and to assume personal responsibility for corrective action. When the causes of unsatisfactory service are beyond their means to correct, their reports are channeled to higher management for action.

For example, a recent report of a visit read:

> "She reads only Hebrew and is not able to read the English lettering on her dial. She said she had previously lived in Toronto, Canada and had no problem because the telephone company there had an instruction card printed in Hebrew. I promised Mrs. G— I'd check into this matter and call on her again.
>
> "I have received a copy of the instruction card from the Bell of Canada and will call on Mrs. G—

again as soon as possible."

Another report contained the following comment:

> "His property includes a small, secluded courtyard which is a very pleasant spot. However, our drop wires run diagonally across this yard. He said he had attempted to have the wires relocated some years ago but was told nothing could be done about them. A quick look showed alternate route possibilities.
>
> "Discussed with the district plant manager. The wires will be moved. Share owner so informed."

And here is a part of still another report:

> "Mr. A— thought we were inefficient in our issuance of telephone directories. His line of business takes him into meat packing houses. He named two where the shelves are loaded with directories and he has heard employees complain that they are only in the way. I explained that we discuss directory requirements with responsible people in business organizations to determine their needs but perhaps in these cases their requirements had changed. I assured him that I would refer the cases for review.
>
> "The Commercial Department has reviewed both cases with resulting decreases in the number of directories provided. I so notified Mr. A— and thanked him for his interest in the Company's affairs. He was greatly pleased with the action we had taken."

Share owners speak up on a variety of other subjects. As a result, the reports of visits give us a better picture than we have ever had before of what our share owners are thinking about—their likes and dislikes, their needs and their desire for information. We can see ourselves as our owners see us. The impression they hold of the Company comes into focus. Their expectations become clearer. And we know better than before what we should do and how we should act.

Yet these visits are not intended to be a survey in the usual sense of an opinion poll. Rather, their primary purpose is to improve relations with our owners and to satisfy their desire for facts. And the information we accumulate from them is of real value.

The Company Benefits

Finally, the company benefits because the program of visiting share owners develops and broadens both the capacities and personalities of management people at all levels and in all departments.

The men and women who make the visits benefit through being trained to accept and discharge broad responsibilities. Representing the business to its owners is a management responsibility of first importance. The experience encourages them to put forth their best efforts.

Reports of visits are reviewed by immediate supervisors, hence those making the visits have frequent occasions to demonstrate skills and abilities

Of special *value to us are the comments and suggestions about telephone service that share owners give to the visitors.*

that may not be apparent in the performance of their regularly assigned, day-to-day duties.

As a result of the training they receive and the continuing opportunities to visit share owners, participating management people become, for the most part, better informed and more articulate concerning the business.

The character of the program stimulates the individual's desire to be as knowledgeable as possible when representing management to the owners of the business. He wants to keep informed of the Company's activities, the broad principles that guide the business, and to understand the reasons for them.

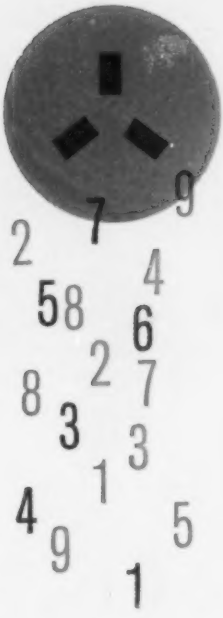
Suppose we see, from their own comments, how some of the visitors feel about this:

> "It has forced me to take the time to read all papers coming my way that might be discussed during a visit. This has broadened my knowledge and interest in the business over and beyond my particular job requirements."
>
> "I know much more about the business and am better able to discuss it in day-to-day contacts with employees and friends."
>
> "I have benefitted tremendously. Not only did I learn more intimately about our operations and policies, but the visits have given me greater confidence when talking with people."
>
> "I have been broadened, better informed, and thus better equipped to carry out company objectives."

During its short but vigorous life the Share Owner-Management Visit program has won a respected place in our business.

Visits with share owners are only part of the over-all share owner relations program. Their particular merit is that they give our share owner relations a human quality that is indispensable for understanding. And this we *must* have, for the success of our business depends on the understanding and trust of our share owners, just as it does on the understanding and trust of our customers and employees.

Open house *nights also play an important part in keeping share owners informed about the business. They are well attended wherever they are held throughout the Bell System.*

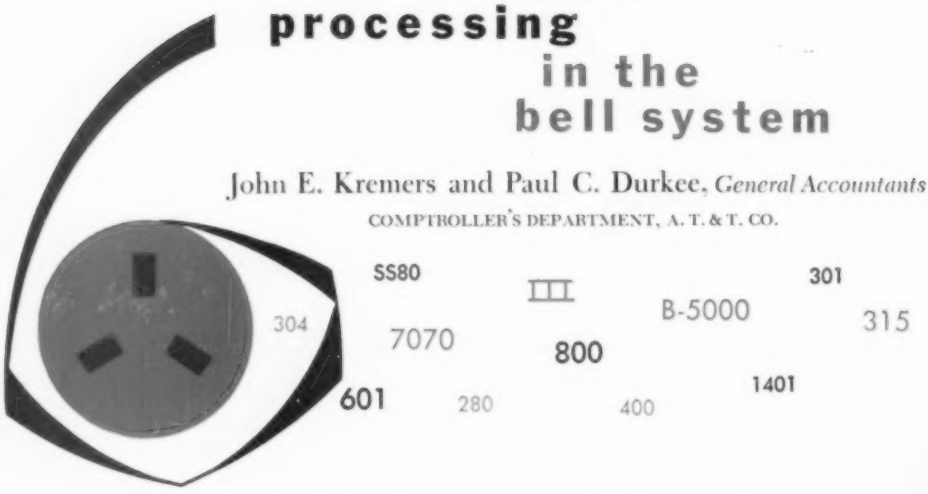


electronic data processing in the bell system

Automation will bring dramatic change, new efficiency, to many of our office operations. But it can only come through long—and complex—evolution

electronic data processing in the bell system

John E. Kremers and Paul C. Durkee, *General Accountants*
COMPTROLLER'S DEPARTMENT, A. T. & T. CO.



THE NUMBERS in the design above symbolize a new era in the business world. They are the manufacturer's codes—the "names"—of some of the computers around which the astonishing new techniques of automation are being built.

Most of the time, fundamental change in the affairs of mankind is so slowly paced we are hardly aware of it. But periodically, a change occurs which affects, or has the potential to affect, large numbers of people in a short period of time. Automation is such a change. We, in the Bell System, like many others, are concerned today with the era of automation. A large segment of this concern is directed toward the specific field of automation in the office called electronic data processing (EDP). So let's see what this means to the Bell System today and in the future.

The first large-scale general purpose electronic data processor, or electronic computer, was delivered to a non-government user in 1954. Since that time, advances and refinements in the computer art have been coming at a steadily increasing pace. The number of manufacturers has also been increasing. Electronic computers continue to become faster, more versatile, more reliable, more numerous and capable of doing more. More and more people are becoming involved in designing computer systems and operating them. We are learning a great deal about these various systems and there

is a veritable flood of publications concerning them.

They have been described as "giant brains" by some and as "remarkable idiots" by others. They have been the subject of countless articles in newspapers and magazines. Some of these articles describe in glowing terms their potential benefits and actual accomplishments. But others have described their limitations and have pointed to costly failures.

The fact is that, like any other tool, they have their capabilities and limitations. They can do some things faster, more thoroughly, and more accurately than humans. And they can perform tasks that other machines, or humans, cannot do effectively. On the other hand, they do some jobs very poorly and cannot be compared at all with the ability of humans. The problem then is to exploit their strengths and not give them jobs they cannot perform well. They perform well on highly repetitious jobs requiring mathematical computations, a reasonable number of "yes-no" decisions or comparisons, and extremely fast retrieval of a limited amount of information. They can be designed and instructed to do a limited amount of learning by experience and to act on future information in the light of what they have learned. But, they are not at all comparable to the human brain in this respect.

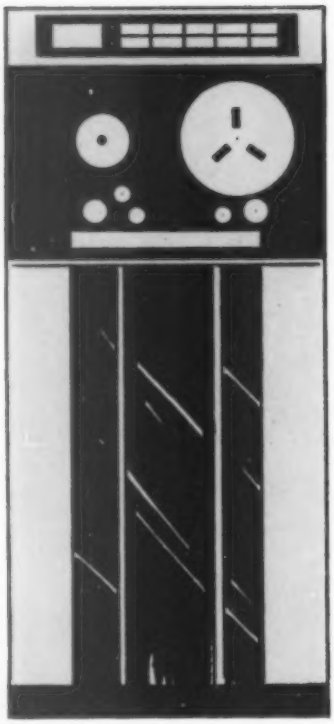
Main console *of Bell System EDP center is seen below. Visitors watch computer console operator through glass partition.*

Computers and Dial Switching

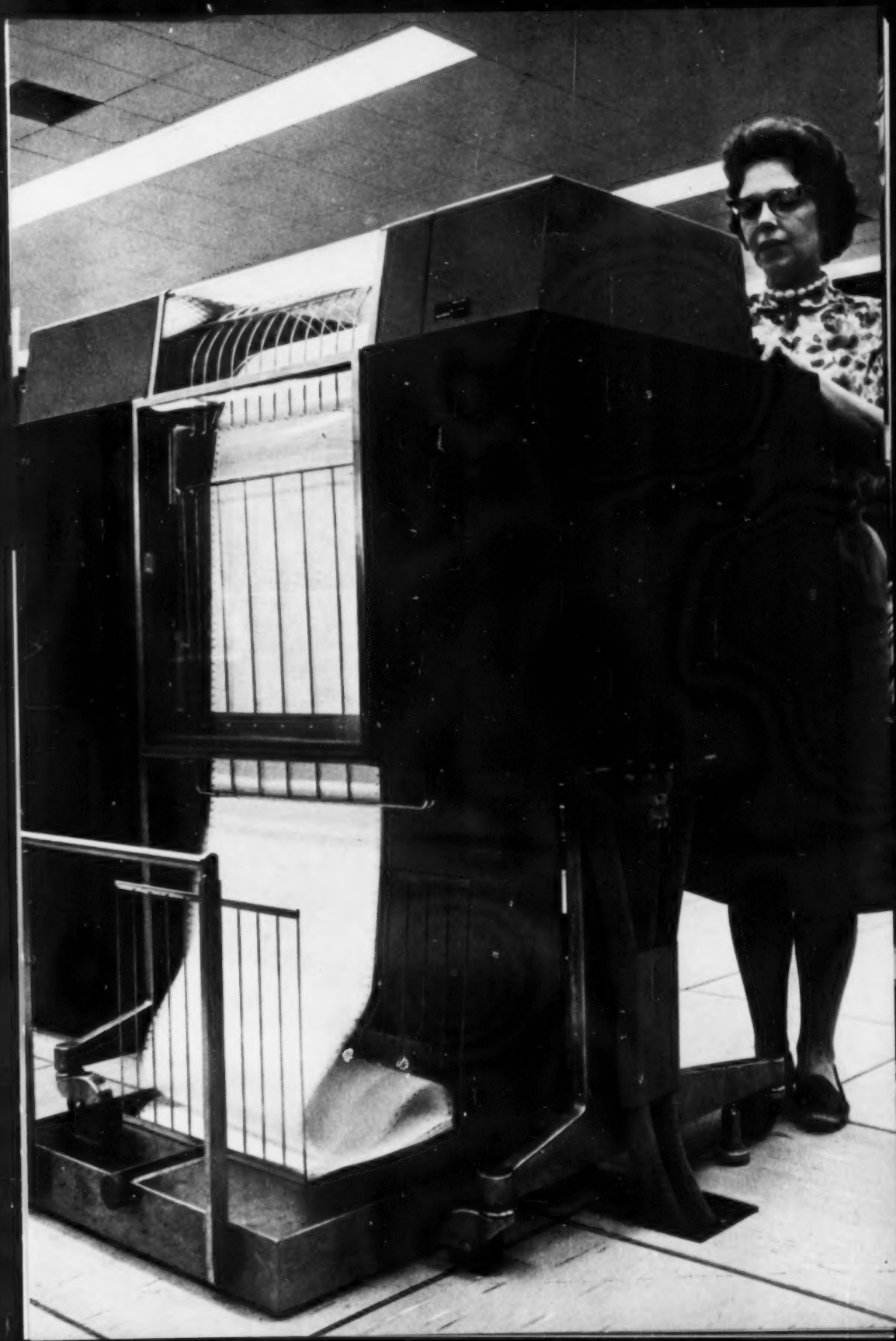
It might help to put the development and use of electronic computers in the Bell System in proper perspective if we compare this activity with the development of dial switching systems. Our dial switching system has often been described as the world's largest and most complex computer. And with the advent of the electronic central office, we will have a computer which ranks with the most sophisticated of those being marketed by business computer manufacturers.

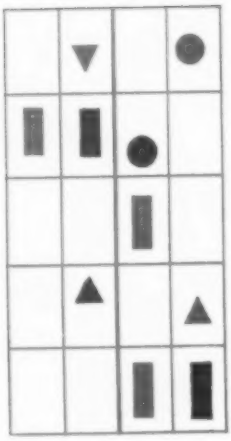
The analogy of dial switching systems and business computers is a valid one in many respects. At the same time there are some important differences and situations which we must keep in mind. Dial switching systems and business computers are analogous in that both are complex devices based on the same principles and operating in much the same fashion. They both have input and output devices, permanent and temporary memories, logic and arithmetic abilities. Both have their genesis in the need to do a more efficient, better quality job in the face of increasing volumes and complexities.

Both involve a great deal of interdepartmental effort and cooperation in their introduction and operation. Both require long-range planning due to their effect on operating procedures. And, both involve the retraining of significant numbers of people and the reassignment of some.



High speed *printer (seen at right) can produce 600 lines of data – a total of 80,000 characters – per minute.*





Supplemental *instructions and inquiries (questions asked of the computer) are typed at the main console (below).*

Some Differences

However, we must take into consideration that the conversion to dial has been going on for over 40 years. During this time we have progressed from Panel, Step-by-Step, No. 1 Crossbar, No. 5 Crossbar, to the trial installation of an electronic central office.

On the other hand, as indicated above, the first business computer was delivered to a civilian customer only seven years ago. Our first large-scale computer in the Bell System was installed in 1958 in the Treasury Department. The second one was put in operation in May of 1959 for the Long Lines Department at Mt. Kisco. The first one for a trial in an Operating Company began its initial cutover in Conshohocken, Pennsylvania in December 1960. Western Electric and the Bell Telephone Laboratories have been using computers for some time for scientific and manufacturing operations, but we are concerned here with the

use of computers for the data processing job in the operating companies.

Another difference is that the dial switching system is a special purpose computer designed specifically for one type of input-output device and for handling one type of transaction. It replaces basically one type of manual operation. However, the general purpose computer we are concerned with in the data processing field can and must be instructed to do a number of entirely different operations. It must utilize a number of different kinds of input-output devices. This means that for each job a particular computer is to perform, detailed logic must be designed and literally tens of thousands of instructions prepared for the computer. A change in computer "hardware," in the type of job to be performed, or in job requirements may mean repeating much of this work for each computer installation.

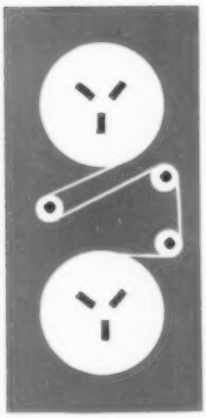
A Long, Costly Process

The conversion to electronic data processing is a long and costly one for any company. In addition to the substantial job of programming the tens of thousands of instructions needed for the computer, we must train the large number of programmers needed and re-train many of our clerical and management people in the new computer-oriented work. We will also have to prepare the computer sites and convert a large volume of conventional records to magnetic tape records. Last but far from least, we will have to plan for conversion periods that include parallel operations under both the old and new procedures and a gradual assimilation of the work. Present estimates are that this conversion cost for the billing and collecting trial alone will be over two million dollars.

Library *(right) contains reels of magnetic tape on which data is stored.*

In 1955, it was determined that there were many phases of our business that were adaptable to EDP, with the possibility of economic and procedural advantages. These were classified by the headquarters interdepartmental business procedures committee into 14 major fields:

1. Billing and collecting.
2. Service order processing.
3. Disbursement accounting operations.
4. Personnel records.
5. Equipment ordering.
6. Supply operations.
7. Directory operations.
8. Outside plant records and studies.
9. Trunk facilities—estimating.
10. Trunk facilities—engineering.
11. Trunk facilities—administration.
12. Construction program—administration.



13. Results reports and operational data.
14. Engineering economics.

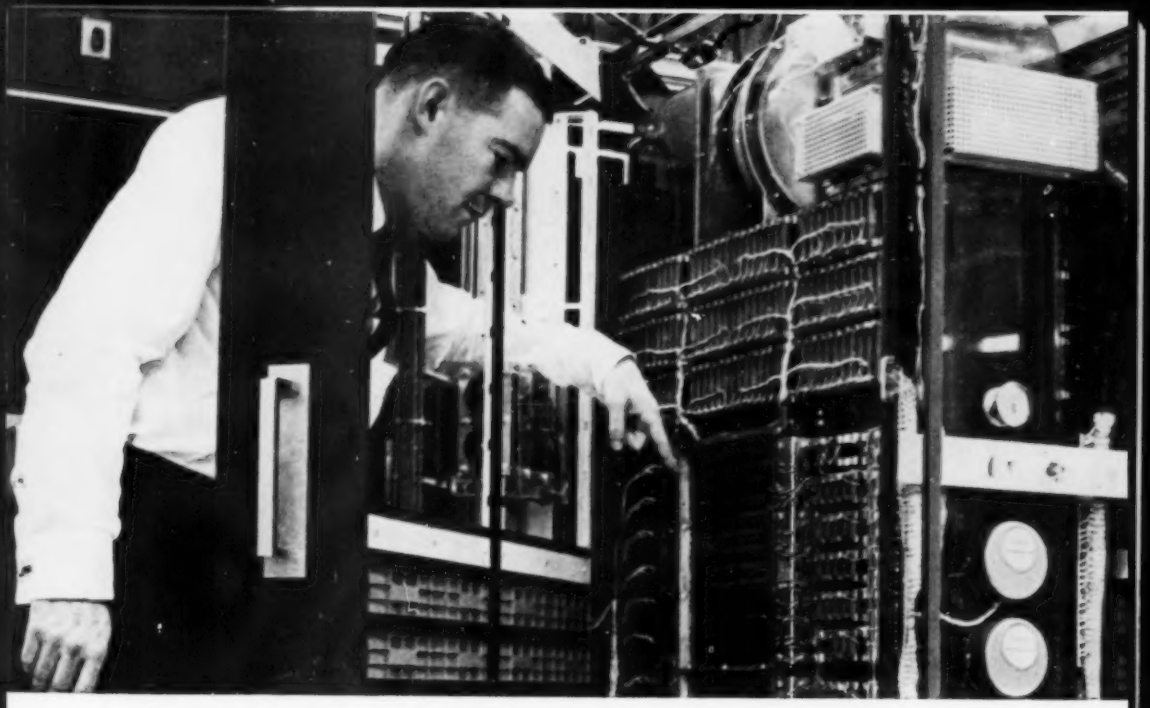
The largest of these, the billing and collecting field, was selected for the first Bell System EDP trial. This field embraces the processing of all major operations involved in the preparation of customers' telephone bills. It also includes certain phases of the customer "treatment" job, involving the selection of accounts for payment reminders and preparation of notices.

The Comptrollers' organizations were given the responsibility for the design and operation of EDP installations in the Operating Companies. It should be noted, however, that because of the nature of many of these fields, as well as the interdepartmental involvement of all of them, all departments are represented on the teams now designing and installing computer systems.

Present Installations

At this time, six Operating Companies have large-scale EDP installations. These are Michigan, New England, New York, New Jersey, Pennsylvania and Southern New England. By the end of 1962 there will be three more companies with large scale installations and according to present plans, four more will be added in 1963. Before the end of 1963 additional computers will also be installed in the companies having prior installations.

In addition to the large-scale computers, there are over 50 medium scale computers now in operation and many more on order. The interest in, and use of, medium scale computers has been growing rapidly. Actually, they were developed after the large scale systems. Medium scale computers are, of course, less expensive. They are not as fast and do not have the large memory



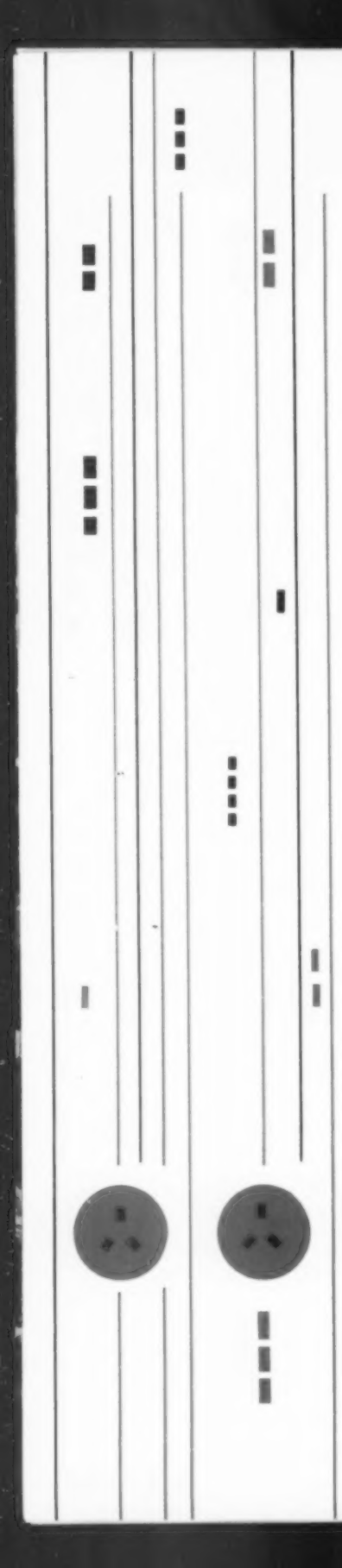
Intricate *wiring of timing mechanism in main frame of central processor resembles central office equipment.*

needed for the more involved jobs. But, they are easier to program and can do many of the less complex but voluminous jobs. We may use them in some offices as an interim step to the use of a large-scale computer, or for a particular job that does not require a large scale installation. These smaller computers are sometimes used as satellites to the larger ones to perform the simpler tasks such as providing input, output printing, etc.—while the larger machine with its large memory and fast computing ability does the more complex work.

System Trials

Because of the heavy expense involved in getting an EDP system "on the air," our approach has been to have one company do the pioneering work, with assistance from A. T. & T. and other interested Bell Companies, using a standardized systems design approach that would offer the maximum transferability to the rest of the Operating Companies. The installation at Conshohocken, Pennsylvania is the trial office for the billing and collecting job. Over 100 man-years of effort went into the design of this system. At the present time about one-half of the 300,000 accounts are being handled by the computer. It is too early for a complete evaluation of this trial, but we have learned a great deal from it. Other companies are already utilizing the information and systems developed at Conshohocken.

Besides the billing and collecting trial, the New England Company has a computer installed at Quincy, Mass. for trials in service order processing, directory operations and disbursements accounting operations—three of the major EDP fields. This trial will involve every operating department as well as the Comptroller's people. The payroll portion of the disbursements job and the alphabetic directory compilation will go on the computer early



in 1962. Following this there will be the processing of service orders, classified directory, and property and cost applications. System trials are also under way at: Southern Bell (local central office equipment ordering); New Jersey Bell (trunk facilities–administration); Illinois Bell (construction program administration); Western Electric (supply operations–New York and Illinois); Pacific Northwest Bell and Western Electric (toll central office equipment ordering).

Ahead of us is a large, long-range planning program for computer applications. In order to utilize EDP installations efficiently, we will have to train and retrain many people in the design and administration of computer systems. We must schedule our work in such a way as to make full use of the computers and also develop methods and design systems to utilize their capabilities most efficiently. It is essential, too, that we learn more about managing the operation of EDP installations. And we must integrate our operations to a greater extent by applying the latest data transmission techniques. Finally, we must constantly evaluate new equipment and new design techniques against our total job.

Just as we had to steadily develop a better communications system than the one we had over 40 years ago in order to meet the demands of today's society, we must develop new data processing systems to meet the management needs of tomorrow.

A widely traveled observer cites some significant recent examples of Western Electric service

What Has W. E. Been Doing Lately?

James G. Blake, Jr., *Editor* WE *Magazine*
WESTERN ELECTRIC CO.

IT'S MY JOB to report on W. E. people at work—making telephones and cable, tubes and relays and transistors, installing central offices, buying supplies, meeting emergencies and the thousands of other separate activities that are part of Western Electric's job.

I don't think any objective reporter could cover this assignment very long without coming to the conclusion that Western Electric is an extraordinarily talented and competent organization. Of course, that fact alone doesn't make W. E. unique because there are many top-flight companies in business today. But one cannot help but remark on the exceptional quality of motivation, the degree of personal commitment to shared goals that inspires individual Western Electric people and develops in them a special sense of partnership with the people of the other Bell System Companies.

This sense of teamwork, this desire to work well with other segments of the over-all Bell System organization seemed to be increasingly felt and expressed by Western Electric people last year.

On the following pages are some of the things they were doing.

THE WORD "SERVICE," in the sense of compliance with an expressed desire or need, is to most people a broad and non-specific term. Not so in Western Electric.

Three factors are included in the understanding that W. E. people have of the word "service"—they are quality, cost, and time. While Western Electric pressed continuously to improve all aspects of its service, I was particularly impressed by 1961 improvements in the time factor.

". . . already substantial chunks of 'interval' have been whittled away . . ."

In a recent issue, *WE* magazine used the pictures on these pages to symbolize the growing emphasis on reduction of delivery time. They were taken in Western Electric's oldest and biggest plant—the Hawthorne Works, just outside Chicago. Bright orange "Readiness to Serve" stickers are affixed to the crates of certain products that stand ready for quick delivery to Bell Telephone Companies.

It seemed to me as a passing observer that these bright spots of color around the shipping docks gave a heightened sense of urgency to the W. E. people working in the area.

However, no observant reporter would be satisfied to describe what's going on in Western Electric as a general, non-specific "hurry up" program. Very soon he'd become aware of the clear, directive influence of a System-wide group known as the "Readiness-to-Serve" Committee, on which, incidentally, two W. E. men serve.

W. E.'s main job, as defined by the "Readiness-to-Serve" Committee, is to cut intervals on certain products it manufactures. The "interval" is the elapsed time between W. E.'s receipt of an order in the factory and the day the equipment is ready to be shipped.

Already substantial chunks of "interval" have been whittled away on the products tackled thus far. Take the product at hand in the pictures—the 740 PBX, an array of equipment that will fill a good part of a railroad boxcar. By any reasonable standard, four weeks for delivery was good service.

Not any more.

Hawthorne devised new and improved methods of handling, and so streamlined and integrated physical motions and paper work that today they will readily make shipping commitments to get this product off to the customer before the end of the week following receipt of the order. Sometimes they make it in one week.

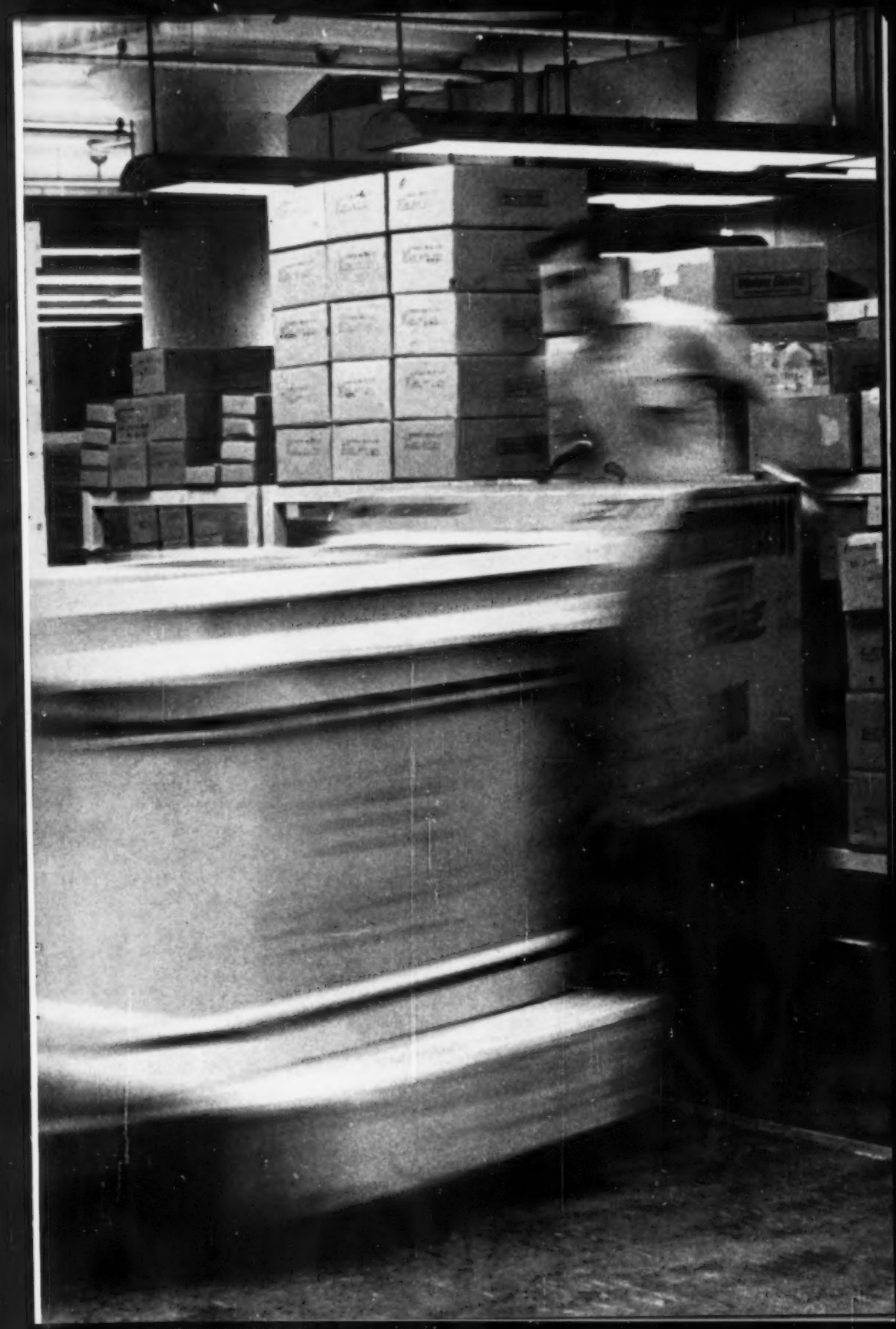
Simplified order forms, data processing, and strong emphasis on standardization, all are contributing to this telescoping of time.

There are other clearly defined programs that have been engineered to reduce the time factor in W. E. service. Territorial Engineering, for example, is a geographical reorganization of the company's equipment engineering function that will save time in providing engineering service to the Operating Companies in all parts of the country. Other programs with a similar purpose have names like "Private Line Assured Service" and "Short Service Order Plan," to name a couple.

But no formal plan will work unless the people behind it have the will to make it work.

I've talked to a lot of Western Electric people during the past year.

They're ready to serve.



". . . not only the day-to-day problems of the business, but the sudden problems of wind and fire and flood . . ."

THE OPERATING TELEPHONE Companies see the face of Western Electric in the 33 W. E. Distributing Houses across the United States. Each of these Houses shapes its activity to meet the special needs of the Bell Company in the area that it serves.

A reporter moving through Western Electric notices immediately how local W. E. Distribution people refer continually to "the Telephone Company" in their normal conversation. It is in W. E.'s Distribution Organization that one encounters the highest degrees of personal and individual "customer orientation" among W. E. people.

Small wonder. W. E. Distributing House people and Bell Telephone Company people together have to work out not only the day-to-day problems of the business, but the sudden problems of wind and fire and flood.

One such problem is being worked on in the photograph above. There Gil Kinney, a Southwestern Bell man, is shown in a corridor conference with W. E. people at the Distributing House in Houston during Hurricane Carla, the worst to hit the Gulf Coast in a century. In this emergency W. E. people worked around the clock and through two week ends to help their telephone teammates restore telephone service quickly in the face of staggering devastation.

The job demanded experienced generalship in Houston; powerful, fast-moving logistic support throughout the breadth of the Western Electric Company; and quick response from hundreds of W. E.'s dependable suppliers throughout the country.

Restored telephone communications helped speed and coordinate the relief work that continued in the Gulf area for weeks and months following the disaster. A tired Southwestern Bell area manager, after most of the job was done, paid a quiet tribute. "Western Electric did a remarkable job. We had everything we needed, when we needed it, where we needed it."

Fast response to emergency is accepted without question as part of the tradition of service in W. E.'s Distribution Organization. But just as evident to the questing reporter is the response of W. E. Distributing House people to the special, urgent business needs of their customer, the Bell Telephone Company.

The picture opposite offers a case in point. Those are three W. E. teletypewriter specialists working late one night on an urgent job in the Los Angeles Distributing House. They are testing out a unique array of teletypewriter equipment that the Pacific Company needs in the shortest possible time in order to meet the urgent needs of its own customer, a local

brokerage house. W. E. began the job at four o'clock on a Friday afternoon even before drawings were available. They worked through the week end and continued on through the days and nights of the following week to get the job done.

The Pacific Company was thus able to meet a sudden and demanding need for service. The local brokerage house had received one more assurance of Pacific's "Readiness to Serve" in the matter of providing complete communications service—on time.

I'll admit that I have a reporter's interest in the unusual and certainly these two cases are unusual examples of the special meaning that "Readiness-to-Serve" has for W. E.'s Distributing House people. But if W. E. did not have long experience in serving the routine day-to-day needs of the Bell Telephone Companies and a close familiarity with the operating side of the telephone business, it could not rise to such levels of achievement.

It's convenient over-simplification to refer to W. E.'s Distribution activities as a "warehousing and repair" operation, yet it's doubtful if there could be a more inadequate description. New machines, new material handling methods, new equipment and techniques for repair and testing, new business methods and procedures are being absorbed into the activity of all W. E. Distributing Houses in a continuing evolution.

". . . anywhere—north, east, south and west—wherever the Bell Telephone Companies are building, growing."

ONE OF THE MOST essential and certainly one of the most challenging jobs that Western Electric is called upon to do is handled by its Installation organization. In large measure, the Bell telephone communications network grows only as W. E. installers connect to it the switching equipment

from which Operating Company engineers can lead lines to the telephones of its subscribers.

Any observant reporter could not help but be impressed by the diversity, flexibility, and completeness of engineering service provided by W. E.'s Installation people but they are probably best known for their work with COE—central office equipment.

Here again is another unique facet of W. E.'s service to its customers. It is one thing to manufacture 11-foot bays of complex switching equipment that may weigh, in the aggregate, several tons. It is quite another matter to set the new equipment up on the customer's premises and, without interfering with existing service, to connect the new equipment to the system that is already in operation, test it, and finally cut it into full service.

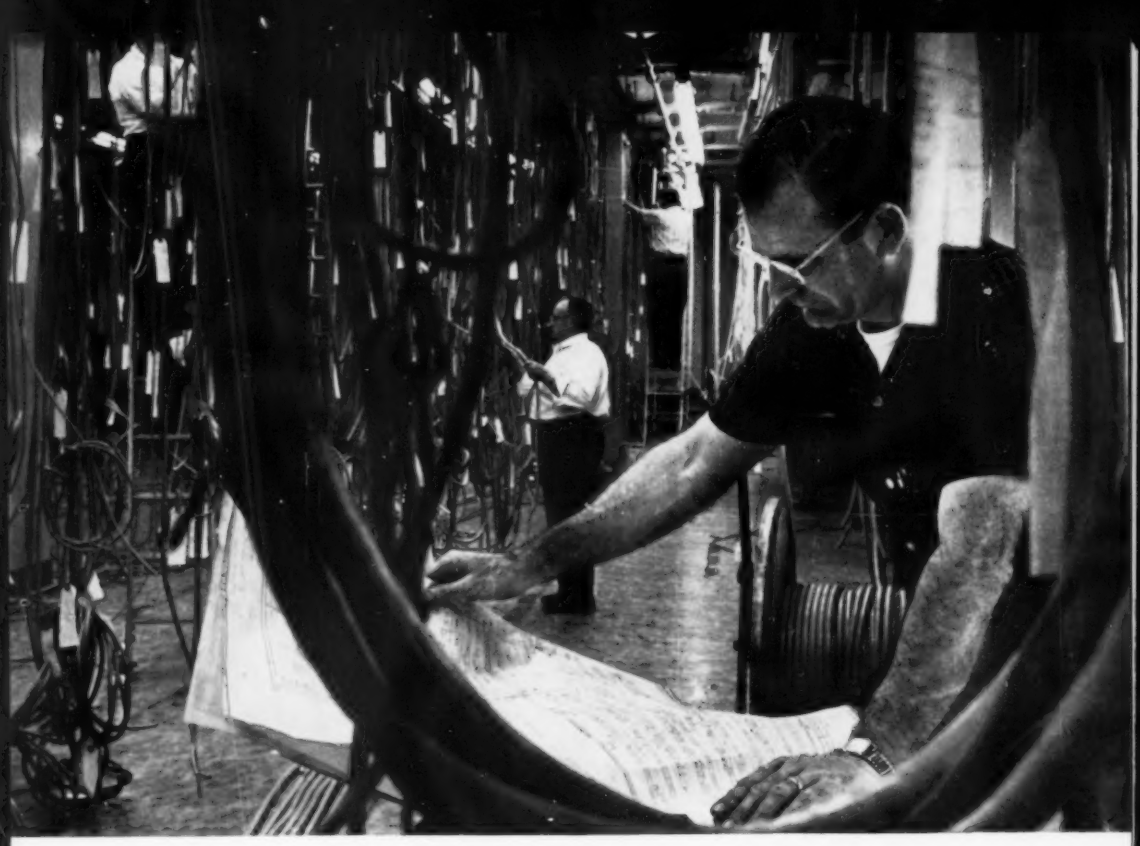
That, in brief, is the main job of W. E. installers. It is a considerable job of work and I am one reporter that is awed anew by the complexity of every central office job I watch W. E. installers tackle.

Central office and large PBX equipment is the kind of product that is shipped directly from the factory to our customer's premises and by the time it's ready to be lifted or trucked into the central office building, Western Electric installers are there waiting for it. The job may be anywhere—north, east, south and west—wherever the Bell Telephone Companies are building, growing.

With a work force of 20,000, units of the W. E. Installation organization were to be found last year in more than 7,300 different places working on 73,000 separate Telephone Company jobs, turning over for service about 2.8 million lines.

Two of those jobs are shown here, one in New York and one in California, an appropriate geographical representation, considering the far-flung dispersal of W. E.'s installation effort.

In the view at right, W. E. installers work on the installation of a Centrex system for the New York Telephone Company which had ordered one of the first of the new systems to serve a Manhattan office building. This job provides a special illustration of Installation's ability to have its people familiar with new systems and arrangements before the first delivery of a new system is made, thus saving for



the customer the time that might otherwise be required for familiarization.

The photograph at left was taken on the other side of the country, at the new Los Angeles International Jetport, where W. E. Installation people teamed with Pacific Telephone men to meet a revised deadline and finish a six-months job five weeks ahead of schedule. Shown on the job are W. E. installation supervisor Chet Chester and Pacific wireman Herb Bayles.

W. E.'s Installation people had a lot of other work to handle in the Los Angeles area last year. Not far from the Jetport an impressively large building complex for the Space Technology Laboratories was being rushed to completion.

For this, the Pacific Company required one of the biggest PBX's ever ordered, and on a crash program basis. Again, working in close daily association with Pacific Company people, the W. E. installation men turned over their part of the job in ten weeks; in doing so, almost halving the initial time estimates.

The sense of urgency that pervades Western Electric and is in part expressed in the "Readiness to Serve" catchphrase, is nowhere more evident than in the Installation organization. It was illustrated again in Los Angeles last year in a downtown central office where extensive modifications were under way to provide a nation-wide teletypewriter setup for the headquarters of two of our larger airlines.

Initial time estimates indicated that 16 weeks would be required to complete the job. The W. E. Installation crew turned the job over to the customer in eight weeks.

". . . the best in telephone equipment and apparatus to the Bell System, at low cost, and in the quantities and in the time that the business requires."

THE SELECTION of a few examples of work offers only a very limited picture of Western Electric's Manufacturing Division. The manufacture of telephone products, the refinement of processes, the search for new materials, new techniques, all are part of a continuing evolution the Division is

pursuing in which there are many brilliant technological achievements.

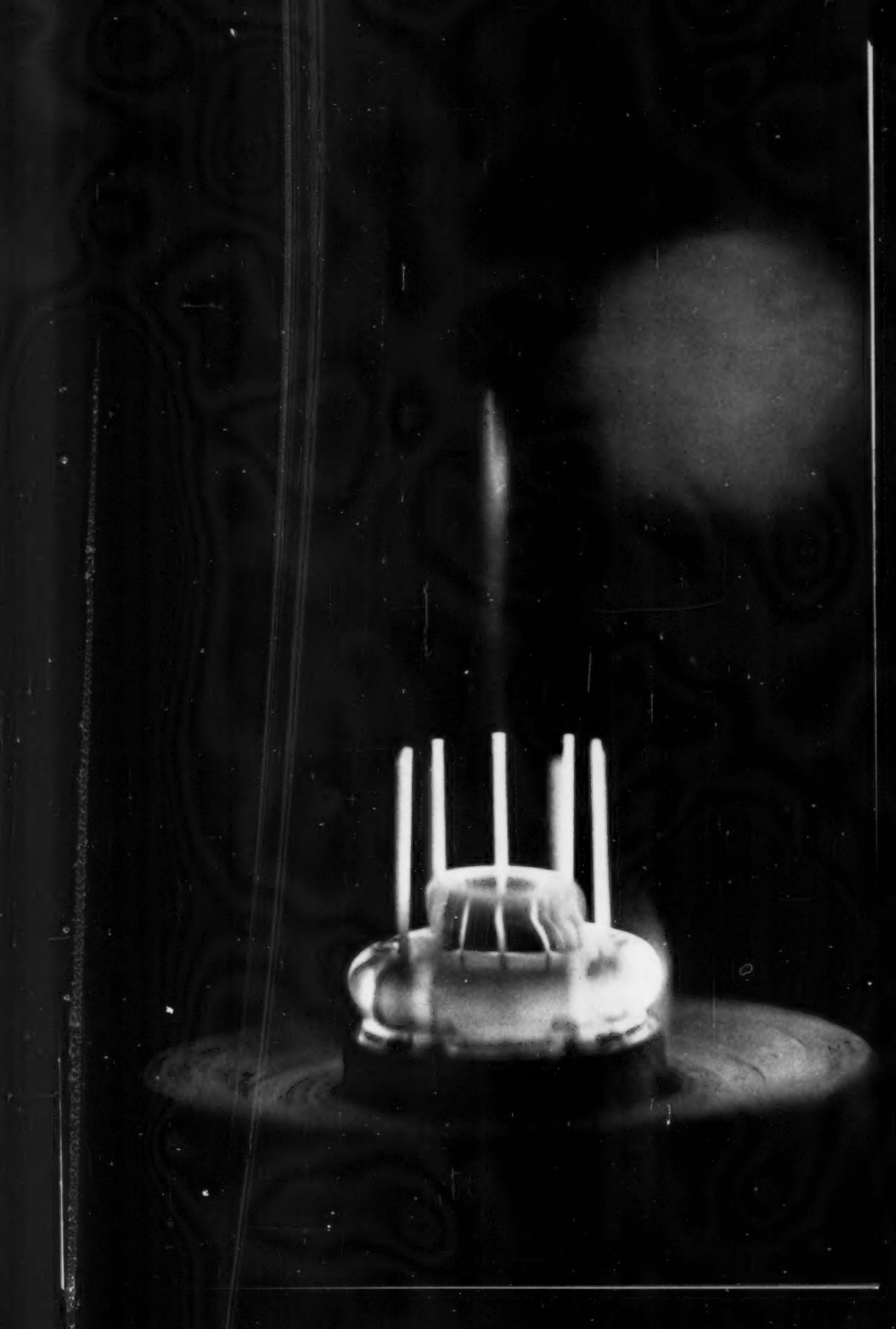
As for separate jobs, in terms of size one of the most impressive is the manufacture of telephones. In one sense, the big factory that does this job at Indianapolis, where the picture above was made, was designed as a single machine integrated by a continuously moving five-mile long conveyor. The conveyor carries components up to bench positions and moves assemblies away through subsequent testing and packing operations. Tight control and close correlation of orders, inventory, and shop loading keep this large manufacturing complex extremely responsive to the changing needs of the Telephone Companies; and year in, year out, new telephones in the millions are shipped from the Indianapolis plant. 1961 was no exception.

Elsewhere, other W. E. plants were making the bewildering variety of things that the System needs.

To be sure, there were many highlights in Western Electric's manufacturing effort during 1961. The influence of automation on W. E. manufacturing processes, for example, became more pronounced, although in the tradition of W. E. manufacture, automation is nothing new. The picture at right shows an automated process used in making electron tubes. I was somewhat startled to learn that this process was developed at W. E. 30 years ago—long before the word "automation" was in common usage.

But last year brought an advance in automation when W. E. put into operation a new automated line for producing deposited carbon resistors to standards of quality that are far beyond the capability of human operators. It is likely that this is one of the most advanced applications of automation in American manufacture today.

A center for research in the field of manufacturing engineering was established by Western Electric near Princeton, New Jersey a few years ago. There today scientists, mathematicians, and engineers expert in many disciplines are pressing forward into areas of new knowledge in the art and science of manufacture. Their objective is to make sure that in the future Western Electric will continue to provide the best in telephone equipment and apparatus to the Bell System, at low cost, and in the quantities and in the time that the business requires.



What Has W. E. Been Doing Lately?

". . . a result of sustained engineering effort that extends over many years, carefully planned, relentlessly pursued."

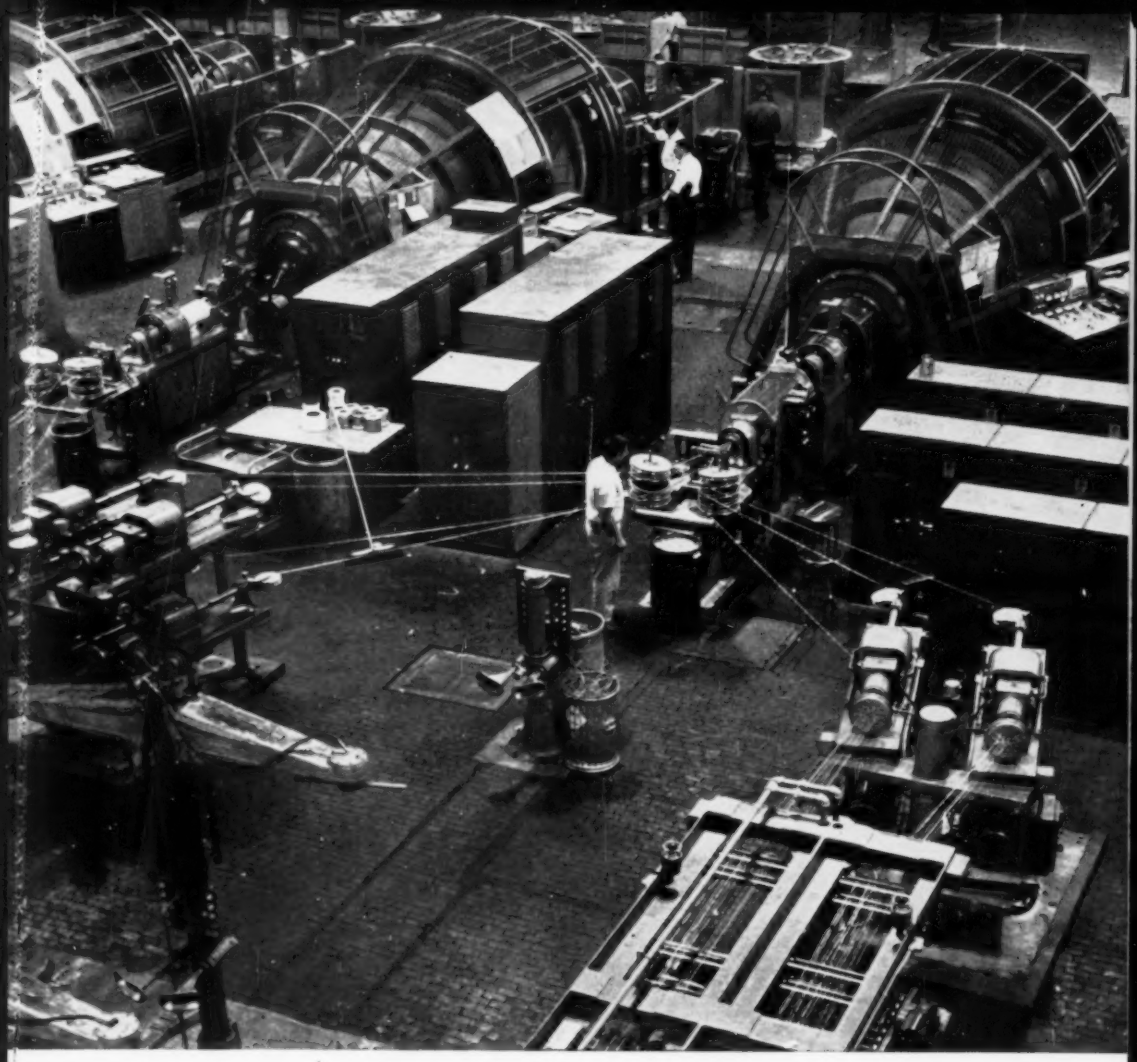
COST REDUCTION in Western Electric does not result from a series of random, happy accidents. Actually, it's planned; even more, it's engineered. After a process is established, our engineers are continually on the lookout for new developments, new processes, new machines, new materials that might subsequently be developed either in W. E. or elsewhere in science and industry, and applied to existing processes to reduce the cost of telephone products without compromising quality.

On the basis of this continuing observation, W. E. engineers can actually set realistic goals for cost reduction in a coming year. Last year, for example, our engineers predicted that existing processes could be so improved as to yield savings of about $19 million in terms of labor, materials and other expenses. It's too early to be certain, but it's likely they came close to the mark, a performance that will help W. E. continue to hold down the prices of its products to the Bell System.

Sometimes an unplanned, random suggestion does result in a sizable cost reduction. The picture at left is of a wire wrapping gun, a tool used to make terminal connections in both manufacturing and installation work. As originally developed, its design called for a bit on the end that cost $13. However, an Installation engineer got an idea for simplifying this component and passed it along to a manufacturing engineer at W. E.'s Kearny Works. He in turn refined the idea some more and showed it to the outside tool manufacturer that supplies this tool. As a result, bits that are equally effective now cost only $2 and annual over-all savings on the cost of this tool may reach $300,000.

But most successful cost reduction achievements by Western Electric are a result of sustained engineering effort that extends over many years, carefully planned, relentlessly pursued. The picture at right, for example, represents cost reduction activity that had its inception years ago, at a time when almost all the cable produced by Western Electric was lead sheathed and has culminated in today's highly mechanized production of Stalpeth cable. This was cost reduction work involving fundamental change in both product and process. It was spurred on by powerful influences — limitations on the quantity of lead that would be available to meet the Bell System's future needs for growth, physical limitations of lead as a sheathing material, and W. E.'s continuing drive to find more economical materials of equivalent quality and more economical ways of making things.

It has been estimated that the



amount of Stalpeth cable produced by Western Electric in one year would cost an additional $10 million if it were sheathed in lead.

Less far reaching in their effect, but nevertheless important because of the aggregate savings they make possible, are the minor alterations in process that may save only a few pennies per unit. A reporter cannot help but see in them the small steps by which the manufacturing art continually evolves.

Last year, for example, the method of fabricating dial plates on Princess phones underwent minor revision that netted a savings of two cents a set. Savings on a single unit, negligible perhaps; on a year's production of Princess phones — over $16 thousand.

Like all other manufacturers, Western Electric has had to pay increasingly more for material and labor over the years. It is singular evidence of the effectiveness of its continuing cost reduction engineering that, in the face of higher costs on all sides, it was able nevertheless to reduce prices last year on a wide range of products.

". . . a reduction to the minimum of research and development time and the quick entry of newly developed products into service . . ."

REGULAR VISITORS to Western Electric manufacturing locations are quite accustomed to seeing sections set off as "Bell Telephone Laboratories," and

1961 brought further development of the "branch laboratory" concept in which, as seen above, BTL people work side by side with W. E. people in the company's major plants.

The problem of manufacturing a specific product is shaped to a large extent by the nature of the product itself and a process cannot be made ready until adequate information about the product is at hand. With BTL people working at the manufacturing location, W. E. engineers begin planning or modifying processes almost as soon as product information is developed. The result is a reduction to the minimum of research and development time and the quick entry of newly developed products into service in the Bell Telephone network.

Between BTL product engineers and W. E. manufacturing engineers there are no fixed limits of interest. The Laboratories scientist and engineer concerns himself with manufacturing considerations and the manufacturing engineer has an influence on product design. Between Western Electric and Bell Telephone Laboratories this interrelationship has never been more apparent than it was during the past year.

At the Merrimack Valley Works, for example, where the photograph at right was taken, there are over 160 BTL people manning the branch lab. It was here that the BTL-W. E. team got the complex TL Microwave system into manufacture in half the time that initial estimates indicated would be required. That's Bob Friis, Bell Labs systems development engineer conferring with Walt Stieblitz of W. E. over a model of a TL installation.

Today, principally as a result of the closer working relationships made possible with the establishment of BTL branch labs at W. E. plant locations, many phases of product and manufacturing development that had traditionally followed one another in succession are now carried forward concurrently. The result has been pure gold—time saved in getting new products to the Bell Operating Companies.

". . . price levels . . . are now about ten per cent lower than they were in 1950."

LAST YEAR, W. E. President Romnes advised Bell Company presidents that Western Electric was cutting its price to the Operating Companies for exchange cable. The aggregate savings to the companies was about $7 million.

Sometime later, in July, he wrote again to the presidents to announce that further reductions in the prices of a variety of Western Electric products might save their companies an additional $26 million on an annual basis.

You've probably already read somewhere that these reductions have brought W. E. price levels on products it manufactures for the Bell System to the lowest level reached in the past ten years. They are now about ten per cent lower than they were in 1950.

This achievement in turn enables the Bell Operating Companies to offset, at least to some degree, their own increasing costs for things other than manufactured telephone apparatus and equipment.

Some details of the W. E. price story are contained in the chart at right. In contrast to W. E.'s performance during the ten-year period in question, price levels of "durable goods"—items like heavy machinery, cars, refrigerators and stoves—have gone up 40 per cent while the level for electrical machinery and equipment made by others has risen 50 per cent.

Note in the second band how the cost of the basic ingredients used in producing W. E. products has increased—particularly wages. The third band represents W. E.'s performance. The prices are in general at lower levels than they were ten years earlier. But even where price levels went up (as in the case of the six per cent increase in the price of wire and cable other than exchange) the cost of raw materials going into those products was up in far greater proportion.

How was W. E. able to do this even though the cost of doing business has gone up steadily?

I'm now going to indulge in some personal opinion.

Cost reduction engineering (at Western Electric, another name for a search for continual improvement) accounts for a good part of this performance but not all. After all, no program, system, or method will work well unless the people using it want it to work.

Here's what I think.

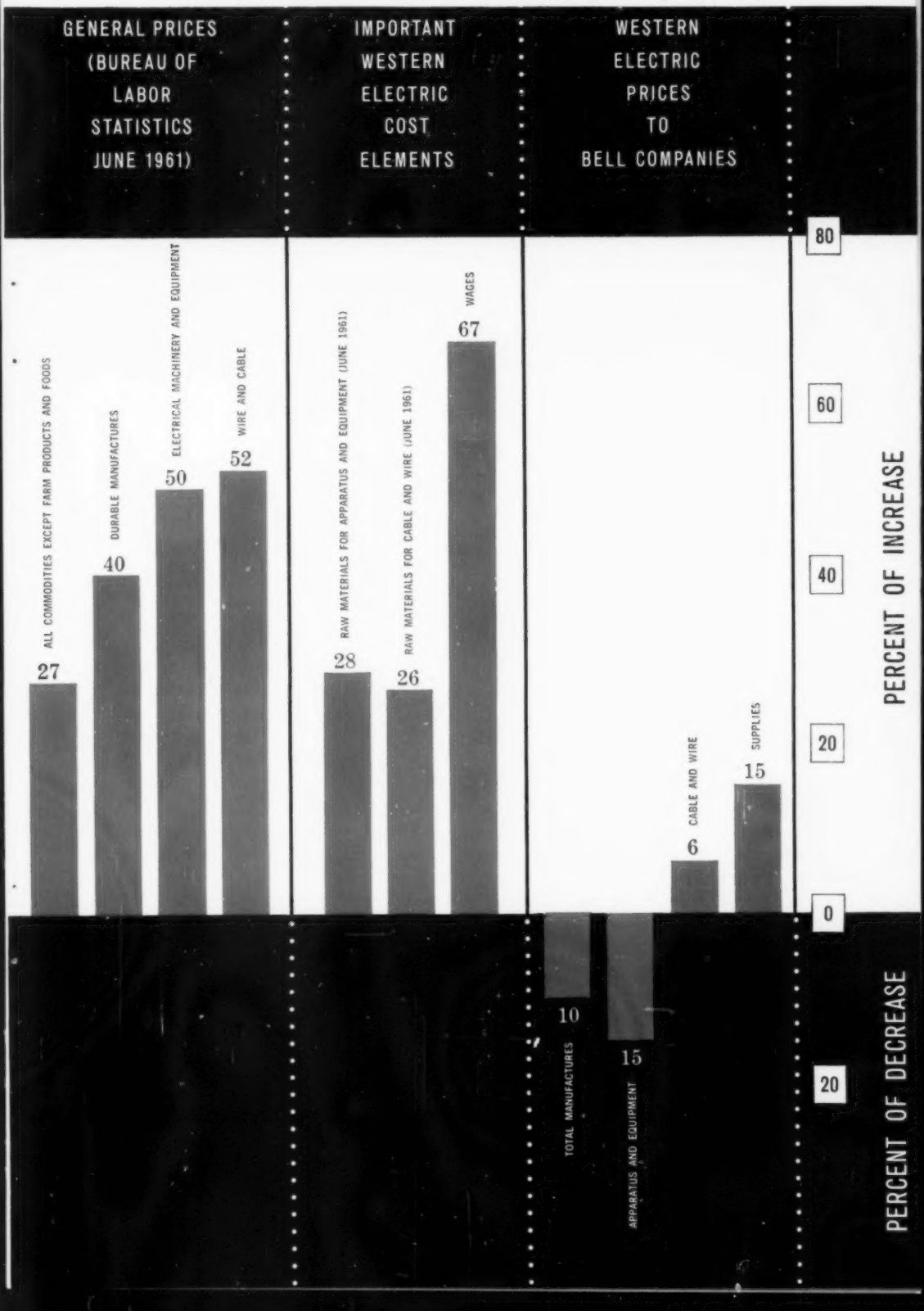
I think that the main ingredient in Western Electric's accomplishment is a matter of spirit—a sense of purpose that the individual W. E. employee shares with other Bell System men and women. Together, their purpose, in the most general terms, is to develop, build, install, operate and maintain the system by which Americans communicate with one another and the rest of the world.

It's a job that no one person, no one company can do much about alone. But Bell System companies, by working together, have done the job well in the past and share a common determination to do it better in the future. W. E. people share in full measure in this determination.

To sum it up, that matter of spirit in W. E. to which I referred is a strongly felt sense of teamwork with the rest of the Bell System. We do our jobs better because we do them together.

A Comparison of Change

(Price Levels on Jan. 1, 1950 and on July 1, 1961)



This fresh, forthright approach to the measurement of quality in our installation and repair work will enhance our ability to give the customer service as he likes it

Management Quality Control

G. Robert Knell, *Plant Customer Services Administrator*
OPERATIONS DEPARTMENT, A. T. & T. CO.

WE IN THE Bell System could well think of our services in terms of a paraphrased TV ad—"quality is our most important product." And Plant people are front line guardians of this quality. During the year they will visit customers over 30 million different times to install, rearrange or repair telephone services. Each of these visits is an opportunity for installation and repair people to sell themselves and the Bell System on a personal basis to the customer. The importance of such face-to-face contacts cannot be overemphasized in giving a good impression of ourselves to the public. We think we are good—but do our customers think so?

Our goals in the installation and repair fields are to:

- Make an appointment that is convenient to the customer.
- Keep that appointment.
- Then, do the job in a manner which completely satisfies both the customer and the needs of our business.

Finding out how well we meet these goals is difficult, but difficult or not, knowing the facts is a management must. Our Installation Service and Exchange Maintenance Indexes have been our principal service measurements in these fields. But they are "Technical Indexes" oriented toward what *we* think the customer wants—not necessarily what the *customer* really wants. For instance, until recently one component of the Installation Service Index measured the per-

centage of time during which we offered to complete the customer's service on or before the day after tomorrow. This bore little relation to how well the customer was satisfied—we may have done his job the day after tomorrow when he really needed it today. Now, as a part of a new installation service index, we look at this component differently. We score against ourselves when the customer is not granted an appointment for either the day or the time he requested. This, then, is more realistically customer oriented. Similar changes have taken place in our Exchange Maintenance Index—our measure of the repair service job. But, both indexes are still somewhat technical—they still, to some extent, score in terms of what *we* think we should do.

System-wide we are meeting our index goals today and, by these standards, we are doing a good job. However, we may be like the dog food manufacturer—he made the best dog food but the dogs didn't like it. We are meeting our established service goals but—do customers like our service?

Comments volunteered during contacts with the business office, repair service bureau or traffic operator – our measure of the "third dimension"—help us to evaluate customer opinions of our service. But we need to know more about what the customer thinks of the "whole chain of events" that make up his particular service package—how he reacted to the appointment we made, the time we arrived, and the way we did the job. We have not been sure that the customer was in fact satisfied with all of the piece parts. During the past year we have been studying ways to look at the job package as the customer looks at it—in other words, after it is completed.

What Do Customers Really Think?

Plant and Statistical people here at "195" and in the Companies have been working to find out what customers really think about our installation and repair service and to identify the kinds of things which need more emphasis. A mail-out questionnaire designed to obtain customer views on recent installation work was tried in three areas. Sent to 4,500 residence customers statistically selected from those having had installation work recently completed, it produced over 3,000 informative and helpful replies. This high return must mean that our customers have a strong interest in their service package.

What did these people have to say about us? About 95 percent of them said they were either completely or fairly well satisfied with the entire contact from the time they ordered their telephone service until the last screw had been turned and the installer had packed his tool bag and said goodbye. The other 5 percent were not so well satisfied and in some cases were severely critical of some phase of the job.

Even though 95 percent had indicated their overall satisfaction with the entire contact, about a quarter of all the people had some critical comment

to make. Remarks ran the gamut from "the bell is too soft" (or too loud) to "I could not receive incoming calls after your man left my house." Such comments can be most helpful in better managing our job so that, within the bounds of economic good sense, we can in fact give the customer what he wants, when he wants it and as he likes it.

Their Comments

How did we generally shape up in the eyes of our customers? Humanly we "goofed" sometimes—failed to keep a promise or did something wrong—and they told us about it. And they questioned our flexibility, methods, practices or people.

Quite a few said something about appointments. We were not flexible enough in granting the particular day the customer wanted, or we asked that he be at home for too long a time. Others had remarks to make about the way we went about our work in their homes. Some said we didn't tell them about our new services while others said we talked about them too much. Still others commented on the appearance of the job or the way the equipment worked. Taken as a whole, these opinions pinpointed both the one shot mistakes and the broader areas in which we can actively work to improve our "image."

In '61, with the cooperation of Operating Company people, we also took a critical, personal, on-the-job look at some recently completed installation jobs. Since the '20s local Plant management people—and in some cases Plant staffs—have been making "quality inspections" on completed installation and repair jobs. Like indexes, these were generally of a technical nature: does the equipment work as it should? Did we use the right screw? Were the fasteners properly spaced? Such inspections were primarily intended to permit local supervision to check the workmanship of their people. Thinking as customers, it was evident that we must take a more critical overall look at our jobs on customer premises.

Through the Customer's Eyes

A new inspection procedure has been devised and this year is in use for the first time throughout the Bell System. This procedure attempts to look at service through the customer's eyes as well as our own and checks such general areas as:

- Does the customer express discontent with any part of the contact from the order to work completion?
- Does the inspector notice conditions not specifically mentioned by the customer which might displease or produce later dissatisfaction?
- Were there deviations from technical standards which now or may later affect the customer's telephone service?

- Was the job well planned and efficiently carried out by the workman?
- Was the "paper work" accurate and all of the facts needed for the business properly reported?
- Is there any evidence that the workman failed to consider his own, the customer's or some fellow employee's future safety?
- Did the workman make helpful suggestions about the services available?

Objective Inspection

These Quality control inspections of installation and repair jobs are a two-edged sword. Locally, on an appropriate "day in-day out" schedule, inspections by management people—from foreman to general plant manager—can provide a personal view of how their people are doing the job. Such direct contacts with the customer and the work done on his premises are an effective guide for management planning toward better service and more efficient operation.

On a broad Company or area basis, a statistical sample of jobs objectively inspected by people not directly associated with them can form a sound basis for comparison. To provide such a measure of the job, many of the Companies are taking the "internal audit" approach. Members of the Comptroller's Department who have no direct responsibility for the installation and repair phases of our business do the sampling inspections. These inspections can support by personal contact other known facts about the customer's satisfaction. And, equally important, they can furnish means for assessing the efficiency of Plant management as a whole.

January 1, 1962 the Companies introduced a new measurement plan, "Management Quality Control For Installation and Repair." It incorporates the features of mail-out questionnaires and premises inspections that we have just discussed. The plan provides us with both a direct customer view of our service and an opportunity for us to assess the kind of job our people are doing in our customers' homes from both a service and a technical standpoint. Incorporating customer opinions of our job into the measurement and control of installation and repair work should appreciably enhance our ability to give the customer what he wants, when he wants it and as he likes it.

Editorial

Editor's Note:

This review of some pertinent legislative proposals which will come before the current session of Congress gives added stress and timeliness to recent discussions of these same matters which have appeared on these pages.

In The Spotlight Again

While the newly proposed tariff legislation is expected to garner much attention this session of Congress, "old" legislative proposals will also have their day in the spotlight.

Among the foremost of such proposals are those concerning possible tax revision: investment incentive tax credit, repeal of dividend credit and exclusion, and withholding tax on dividend and interest income. In addition there have been numerous proposals to repeal the communications excise tax.

All are of interest to the Bell System.

The Administration's tax revision bill —which was introduced last spring— will directly involve three of the above mentioned: investment incentive tax credit, repeal of the dividend exclusion and credit, and withholding on dividends and interest.

The bill provides tax credit to business to encourage increased investment in plant modernization and expansion. The Administration anticipates that the loss of revenue expected as a result of the credit would be offset in part by the withholding tax on dividend and interest income and by the removal of the dividend credit and exclusion.

It is hard to determine whether or not tax credit would promote economic growth. However, it does seem apparent that the proposed tax credit would "build on" to depreciation laws that inherently tend to *limit* growth.

In other words, the problem is basic and the proposed tax-credit remedy is superficial.

The problem is basic because, with continuing inflation, our present tax laws limit depreciation allowances to dollars originally invested in plant. Because of this limitation, the purchasing power of the allowances are not equivalent to the purchasing power of the dollars initially invested. (Since 1940, inflation has cut the dollar's purchasing power by more than a half.)

Appearing before the tax-writing House Ways and Means Committee last May, Alexander L. Stott, A. T. & T. vice president and comptroller, suggested that ". . . depreciation allowances must be equivalent to the purchasing power of the original investment in the assets being consumed in production or the capital invested

in the business will be taxed away in the guise of income."

To prevent this siphoning off of capital, Mr. Stott advised the use of "price level depreciation" which would reflect the changes in the purchasing power of the dollar. Changes could be measured by the use of some index such as the Consumer Price Index.

This is the type of depreciation reform that would really encourage the modernization of the nation's industrial plant. (See: "Needed, An Adequate Tax Depreciation Policy," *BTM* Summer 1961 *Ed.*)

Dividend Credit and Exclusion

The question of economic growth is also tied up in the proposal to do away with the four per cent dividend tax credit and the $50 dividend income exclusion.

In long range terms, the loss of the credit and exclusion may well hinder desired economic growth. As Rep. Curtis (R-Mo.) remarked in Congress, the dividend credit and exclusion are "among the incentives which have encouraged the low and middle income groups to invest their modest savings in America's business."

Conversely the repeal of these tax adjustments would "discourage" investment by low and middle income groups. This would have a negative effect on economic growth. For, with the progressive tax rate structure—which limits the available investment capital of higher income groups—business has had to rely increasingly on the expanding number of small investors for its growth capital.

(Stock ownership has almost doubled in the past ten years—a greater part of this increase has occurred in the moderate and low income sectors according to the University of Michigan Research Center. More than one-half of A. T. & T.'s two million shareowners own less than 50 shares.)

Putting economic analysis aside, the need for substantial dividend credit has been recognized as essential for economic growth by such high growth countries as West Germany with its 25 per cent dividend credit, and Japan with its 17 per cent credit.

(The proposal to repeal the four per cent dividend tax credit and the $50 dividend income exclusion is also treated in "Labels or Loopholes," *BTM*, Spring 1961. *Ed.*).

Withholding of Tax on Dividends and Interest

This proposal, drafted by the House Ways and Means Committee, would require corporations and savings institutions to withhold a 20 per cent tax on dividend and interest payments.

While the Committee proposal does allow some exemptions from the withholding of tax on interest income, it does not provide exemption certificates for recipients of dividend income. Thus, all persons and organizations receiving dividend income — whether liable to Federal Income Tax or not — would be subject to the 20 per cent withholding rate.

The Company's opposition to the withholding of tax on dividends and interest was expressed last spring by A.T.&T. Treasurer L. C. May when he appeared before the Ways and Means Committee. "The basic fault with the proposed legislation," he said, "is that dividend payers would be required to withhold funds unjustly from dividends paid to . . . thousands of tax-exempt organizations and the great many thousands of individuals having insufficient income to be liable for a tax."

If such a system were adopted, he said, exemption certificates should be allowed for both shareowners of modest means who have no tax liability and for charitable and other tax-exempt organizations. As mentioned, the present Committee bill does not provide exemption certificates for recipients of dividend income.

Consequently, if the Committee proposal were legislated by Congress, tax-exempt organizations and the overtaxed individual—both those who have no tax liability and those whose dividend tax liability is lower than the 20 per cent withholding rate—would have to file for refunds.

Excise Tax

If any tax law is reformable, it is the present communications excise tax — enacted as a "temporary" revenue-producing measure for World War II.

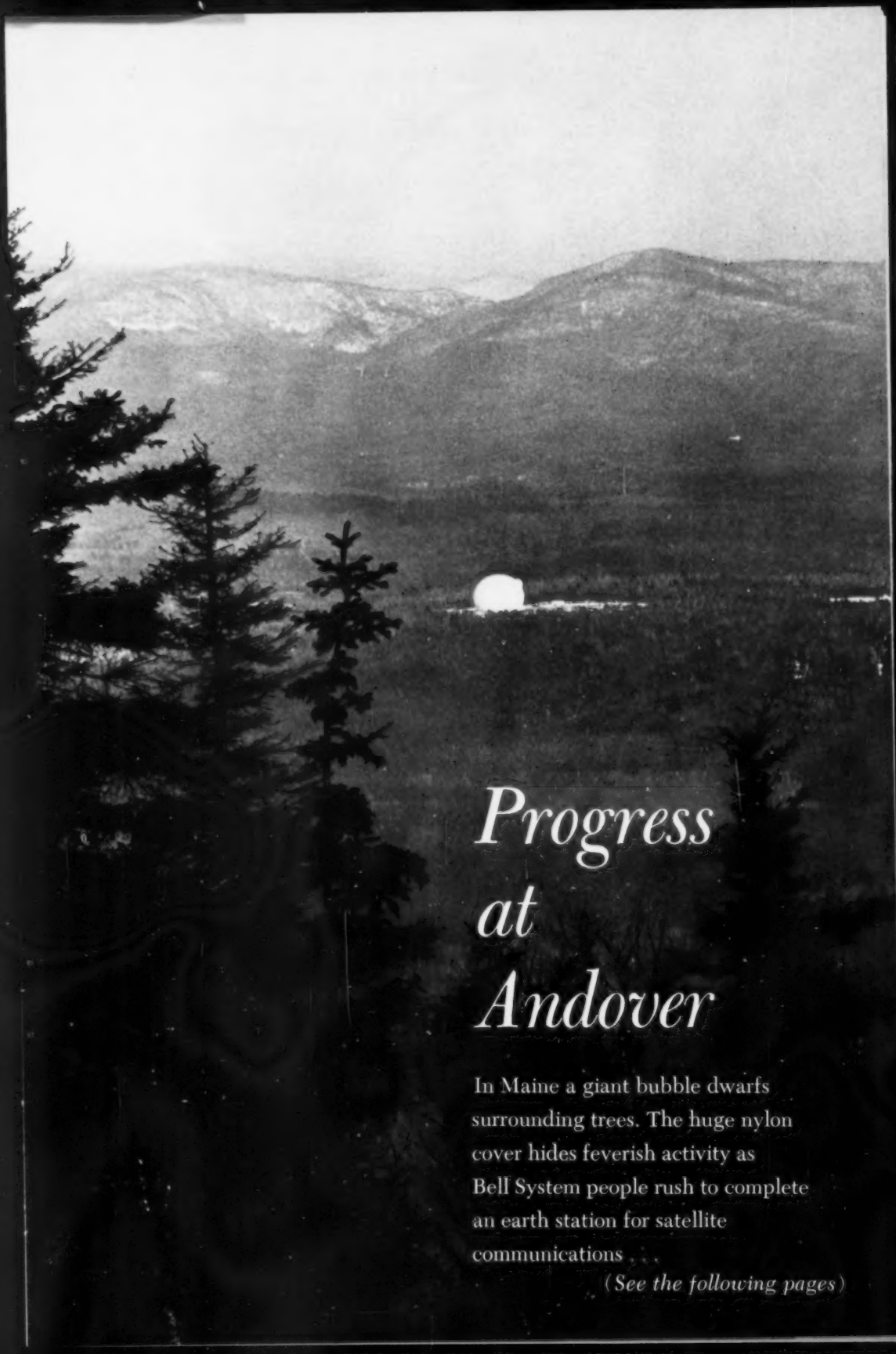
In addition to raising revenue, the purpose of the tax was in part to free circuits for war essential calls.

Today, 16 years after V-J Day, the telephone customer is still paying the excise tax—ten per cent on each dollar of service which amounts to an estimated $17 a year extra on his local service alone.

This tax on local telephone service is scheduled to die on June 30 as was the case last year, but the President has said he will seek its extension.

The greatest direct benefit of repeal would be felt by the telephone customer who would see a decrease in his telephone bill.

It should be noted that of all utilities (gas, electrical, etc.) only telephone service is burdened with an excise tax.



Progress at Andover

In Maine a giant bubble dwarfs surrounding trees. The huge nylon cover hides feverish activity as Bell System people rush to complete an earth station for satellite communications . . .

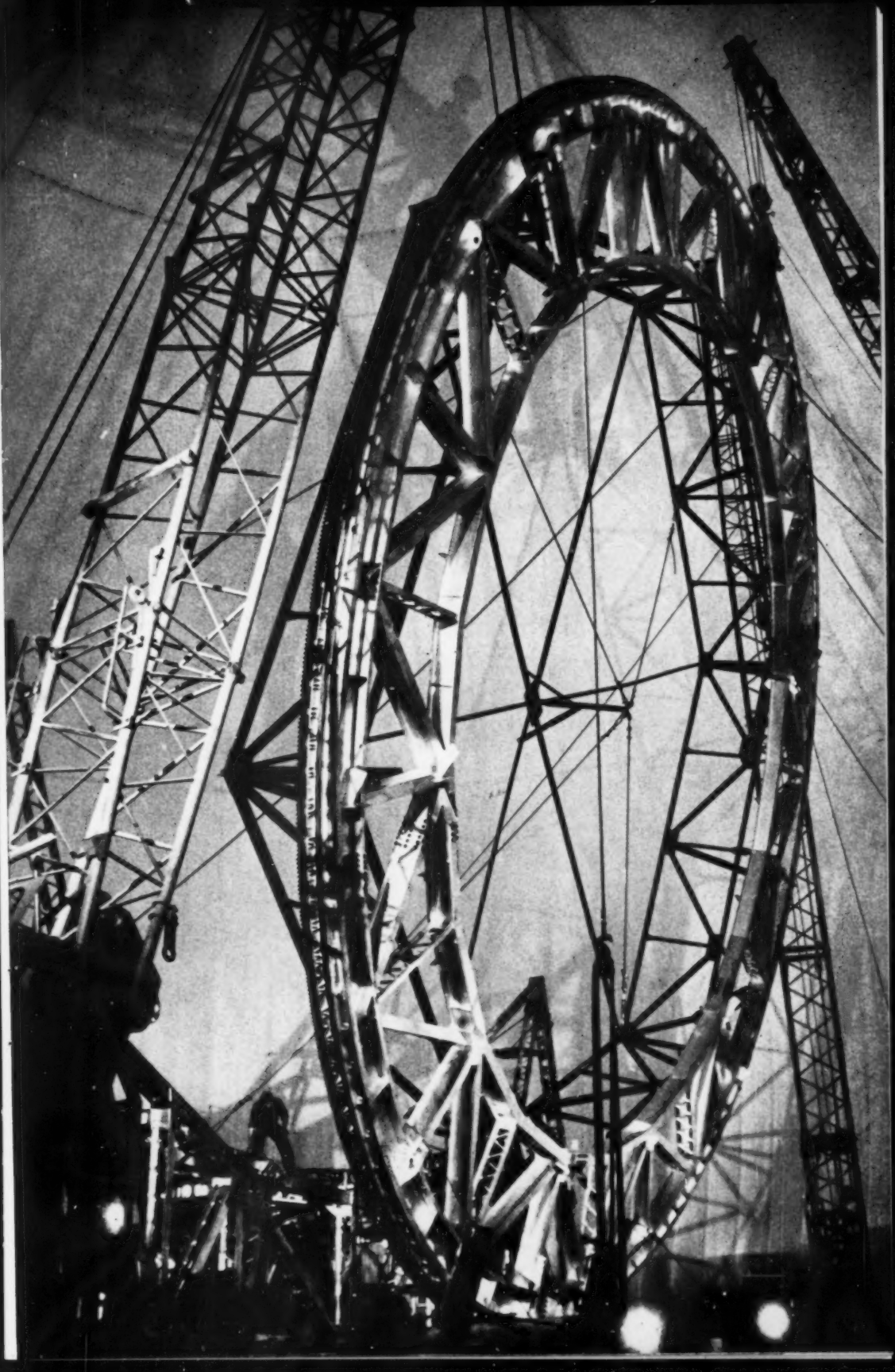
(See the following pages)

Winter's snows impeded supply trucks. Gigantic apparatus, constructed by American industrial firms to meet exacting requirements set up by the Bell System, had to be brought in and installed. But step by step, despite capricious nature, the first earth station for satellite communications at Andover, Maine neared completion. Bell Laboratories and Long Lines people struggled to set intricate equipment into place. New England Telephone Company installers labored to put in complex communications gear. Unlike microwave relay towers on land, the TELSTAR satellite in space would have to pick up and transmit signals from many thousands of miles away. Locating and tracking the three-foot satellite in space is comparable to pinpointing a golf ball 100 miles away. To do this, the massive ground equipment must be precisely engineered.

A weather balloon was released inside the radome at Andover. Floating near the top, it recorded temperature.

Huge elevation wheel is guided into place by man and machine power. Weight of the wheel is 40 tons.

Dwarfing the man next to it, the elevation wheel for the horn antenna is 70 feet in diameter.

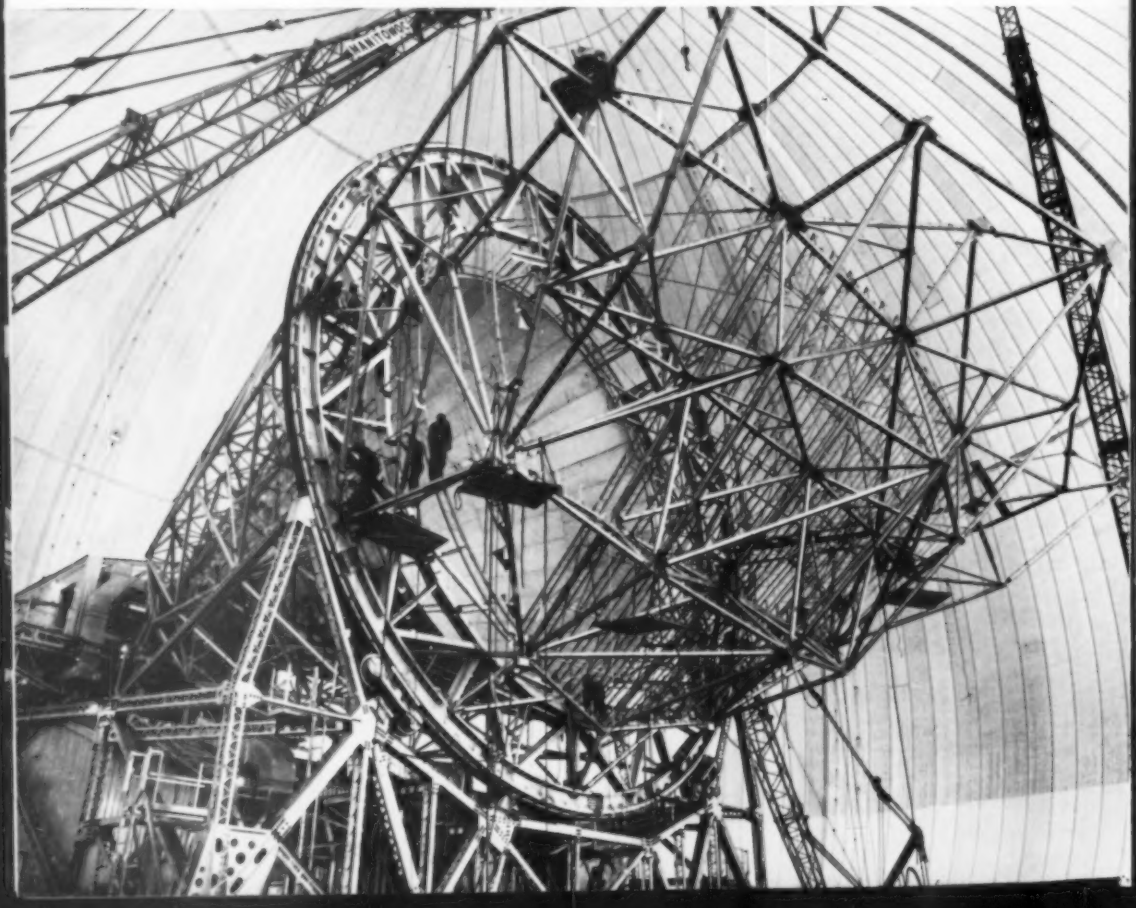


PROGRESS AT ANDOVER

A base tab is alloyed to silicon transistor for satellite under intent microscopic scrutiny at Bell Laboratories.

Special transistors have been made to measure radiation damage to solar cells.

At Andover, workmen complete steel structure for horn antenna. Signals to satellite will be transmitted here.



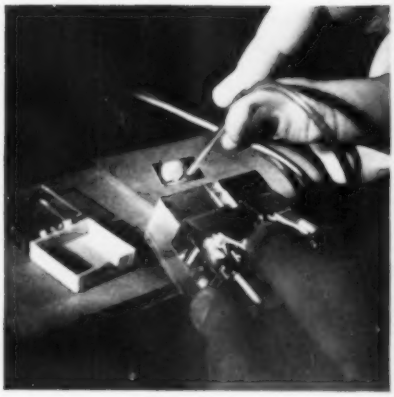
After bombardment with particles, measurements are made on objects in test to determine radiation effects.

Silicon radiation counter is mounted for acceleration test used to evaluate radiation damage to satellite.

As construction progresses at Andover, the Telstar satellite is assembled and its components tested at Bell Laboratories

Scientists and engineers at Bell Laboratories had to take a sphere only three feet in diameter and put into it electronic equipment to do the same job as the equipment at tall microwave relay towers on earth. Thus, miniaturization of equipment was a prime goal. Reliability was essential. The electronic gear will have to endure the stress and strain of a rocket launching. The equipment will then have to function in the extremes of temperature encountered in space. Through frigid cold and withering heat, the tiny sphere, powered by the sun, will have to pick up telephone and television signals sent from Andover, amplify the signals and send them back to earth. To help transform such a dream into reality requires vision, initiative and resourcefulness. But soon, it is hoped, the goal will be reached.

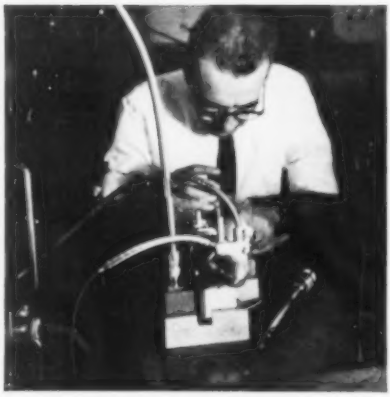
Large traveling wave tube (in oven) will be used in ground station. Small tube (in hand) will be inside satellite.



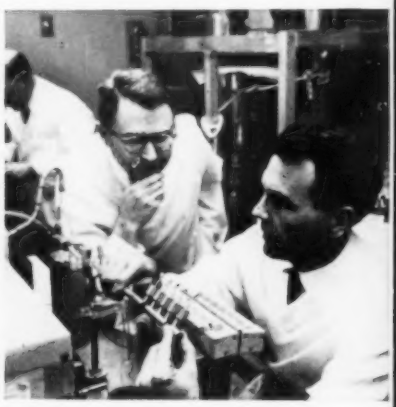
Solar cell to convert sunlight into electrical energy is prepared for automatic test.

Traveling wave tube, for use in satellite, is mounted in holder for shaker test. The tube is shaken in three dimensions, sequentially. Test vibrations can be 50 to 2,000 cycles per second at stresses up to 20 G's.

The Bell System helped make communications history in 1960 by bouncing coast-to-coast telephone calls off NASA's Echo I passive satellite. In 1962, the TELSTAR sun-powered active satellite will be the next pioneering experiment in space communications. If satellite communications are pushed expeditiously – with required emphasis on research and development – by 1963 a commercial system will be possible.



After vibration schedule is completed, traveling wave tube is remeasured. Result is checked against original data.

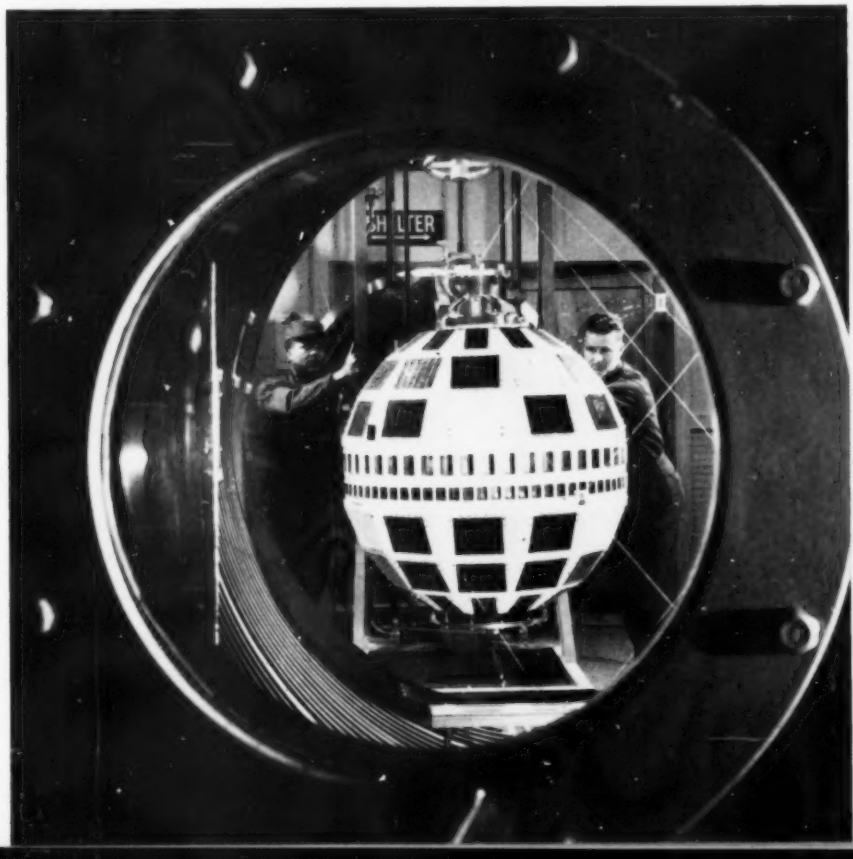


Silicon detectors to measure high-energy particles in space prepared for vacuum-baking.

Solar cells get cleaning before coating to reduce reflection and increase absorption of sunlight.

Scientists check apparatus used to spray purified, partially-molten aluminum oxide coating on exterior of satellite.

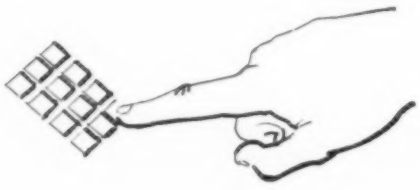
A TELSTAR *satellite model is put into a special thermo-vacuum chamber for tests to determine thermal effects of sunlight on the satellite. When launched later this year the small satellite (less than 200 pounds; 34-inch diameter) is expected to orbit at an altitude ranging from 500 to 3000 nautical miles above the earth.*



A miniature Bell System network, this fast, flexible system can carry the tremendous quantity of information needed to support command decisions

SCAN-A New Communications System for The Military

Robert E. Gradle, *General Manager–Government Communications*
Long Lines Department, A.T.&T. Co.



A newly developed communication system tailored to handle voice, data and facsimile transmission was inaugurated by the U.S. Army on January 5. Called SCAN (an abbreviation of Switched Circuit Automatic Network) it is a miniature of the nationwide Bell System network. It has special switching equipment which gives the customer's private line circuits greater efficiency and flexibility than was possible with previous systems. It is primarily for use by the Army, but the Navy and Marine Corps will use the network to transmit data to their installations.

The arrangements for SCAN were worked out by a team of specialists from the Signal Corps and representatives of the Bell Telephone Laboratories, the Long Lines and General Departments of A.T.&T. Their efforts resulted in a system that offers significant new communication features and the means of smoothly introducing improvements or changes conceived and developed in the future.

Major General R. T. Nelson, Chief Signal Officer of the Army, has stated that he believes the Army now has the finest communications system in existence and that it is making a major contribution to the Defense Communication System. "SCAN," General Nelson has said, "represents a break-through by the communications industry.

"The ideal system would have to be

completely automatic, able to carry any type of signal and accessible from any point on the globe. The SCAN network is a giant step in that direction since, for the first time, it gives the Army an integrated user-to-user service within the continental U.S."

Following World War II, the Signal Corps introduced machine processing of information and statistics. In late 1956 it requested the Long Lines Department to replace a number of point-to-point data circuits with a manually switched data network to serve 140 military installations in the continental U.S.A. The machines did not "talk" directly but data was transmitted from one center to another for further processing. Concurrently with growth in data transmission there was an increase in military long distance voice communication. Ultimately, Long Lines was providing 70 full period point-to-point telephone circuits.

The Need

However, from the military point of view, those data and voice networks lacked important features: automatic alternate routing, an ability to handle changing traffic demands in an emergency, automatic trouble detection on switching equipment, adaptability to other types of communication, access to many installations, etc. There was also a high reliance on human rather than automatic operation. Accordingly, in 1959, the Signal Corps asked for the development of a new system that would solve these problems. Early in 1960 the SCAN system was proposed and accepted. In addition to satisfying the requirements mentioned, SCAN makes groups of circuits available to many rather than a limited number of users and reduces idle circuit time. Thus, it is more efficient and economical than the earlier systems.

Within the continental United States, SCAN gives the Army an integrated, user-to-user service responsive to the needs of voice communication and capable of carrying the tremendous quantity of administrative and logistic information needed to support command decisions. The SCAN network is an integral part of the Army Strategic Communications System, which provides communication services to Army commands in more than 70 countries. Both networks are operated as the Army portion of the Defense Communications System.

Circuits serving 630 locations at 180 military posts, camps and stations are interconnected across the country through four Bell System switching centers. These centers automatically direct communications over the network. They are located away from major target areas in the East, the South, the Midwest, and the Far West.

Initially, the SCAN network will be used for administrative telephone calls and data transmission.

Flexible and Fast

The technical features of the system provide very fast connections. Direct, individual lines to the center—plus the efficiency resulting from the common use of circuits for both telephone and data transmission—also help speed calls. The number of circuits from a particular location varies with the expected traffic volume.

Above all, there is the alternate routing of calls, the feature by which the system is programmed to look for alternate routes automatically for a particular transmission. This is not only a speed factor but it practically eliminates the possibility of traffic being

halted because of trouble on any particular line. Incidentally, if desired by the customer, the SCAN system can be arranged to "spill" voice messages into the Bell System's public message network for completion.

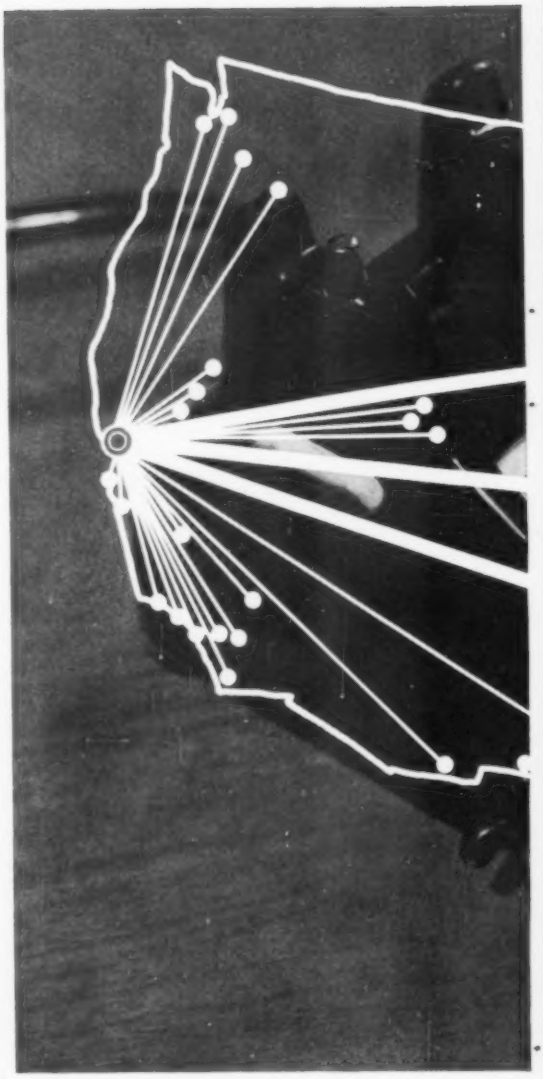
At each of these centers telephone company operators at switchboards are available to provide operator assistance in handling calls when necessary. Conference calls can be set up on either the voice or data circuits. Automatic switching reduces the possibilities of human error in switching calls. However, should there be an emergency, manual operation of this network is also possible.

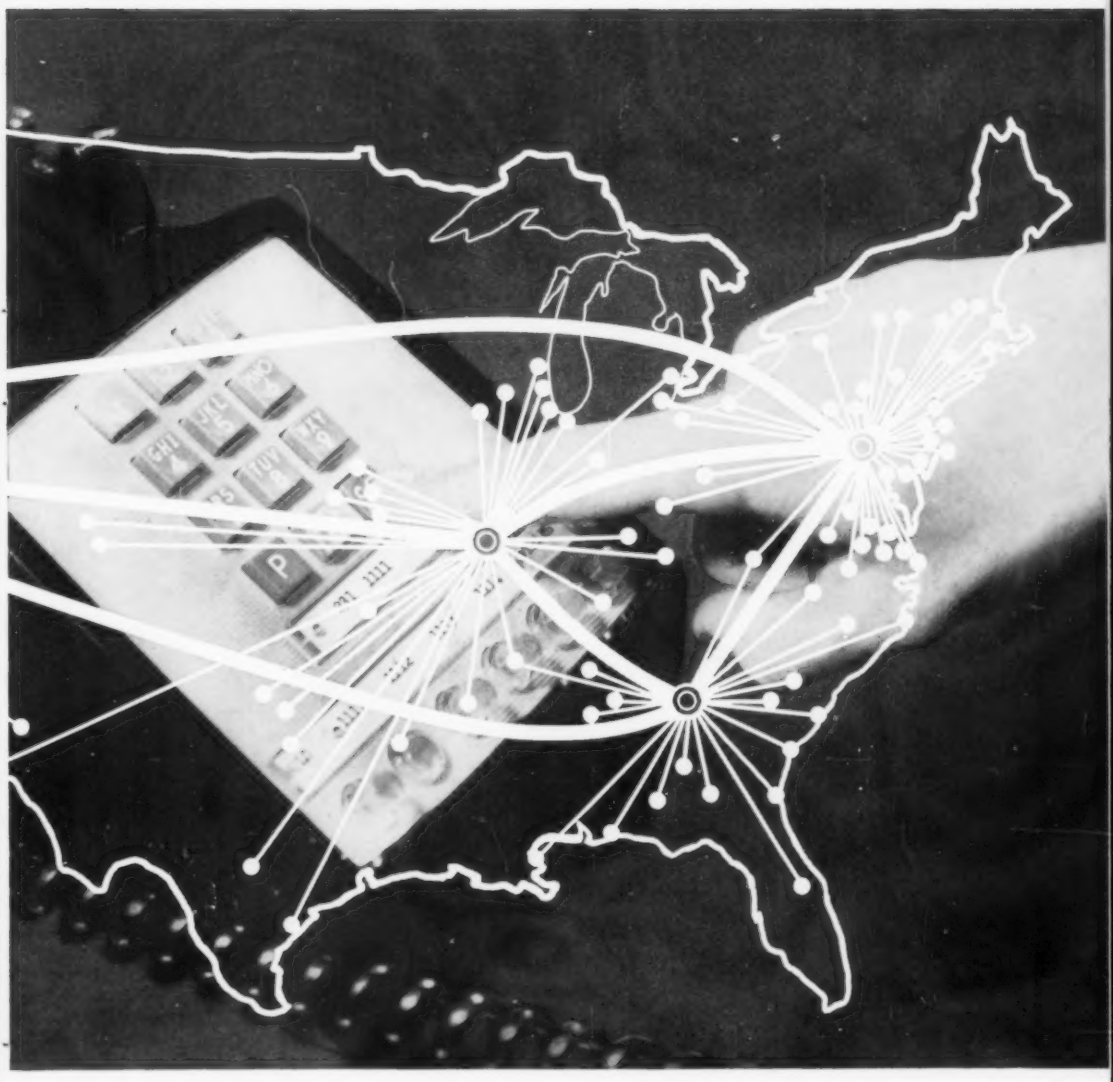
Calls are made over the SCAN network in the following ways:

To transmit data – The attendant first dials the prospective receiving location by key-pulsing seven digits over "touch-tone" (push button rather than conventional dial) telephones provided in these locations. When the attendant at the other end answers, the calling party tells him he has data to transmit. Both parties then operate transfer buttons to put the line and equipment into a data-sending condition. Even while data is flowing over the line, the telephone instrument can be used for other SCAN calls simply by switching to another line.

To transmit voice – The user places calls through the Army Post switchboard operator. This operator selects an idle circuit to the switching center and then dials seven digits to reach the called number. If all direct circuits between the switching centers are busy, the switching equipment selects an alternate route automatically.

For "precedence" messages (either data or voice)–When a user places a "precedence call" and finds all the lines in use, he calls an assistance operator who can take action to complete the call. She can either dial a special prefix with the called number, which gives the user first option on the next available circuit, or she can enter a busy line and ask the users to release it.





Traffic measuring devices analyze traffic volumes and make it possible to estimate the rate of growth in the future. With the SCAN system, stations can be rearranged or added, and the present equipment can be changed as modifications seem desirable or future improvements come into being.

Consideration is being given to changes which will provide even more useful and refined equipment and services for the military.

Colleges and universities need communications systems to match their fast growth. Here are some solutions that can help students, faculty members, administrators

Communications Unlimited For Colleges and Universities

Edward J. Barry, Jr., STAFF REPRESENTATIVE,
MARKETING DEPARTMENT, A. T. & T. CO.

THE MOST effervescent members of our society today are teenagers. In school they're studying harder than ever before, and out of classes they're always on the move—clubs, hops, beach parties, dates, picnics, and so on. And the telephone literally holds their lives together. They use it to plan their activities and make their dates and to talk about them afterwards. They use it to discuss schoolwork—to solve homework problems. Yes, the phone is vital to the teenager.

But what happens when the teenagers leave high school to enter college and the four most important years of their lives? In college this same group has far more important uses for the telephone, because time is so important to the college student—he simply never has enough. In addition to attending class each week plus meetings with counselors and teachers the student of the '60's spends:

- 18 hours studying
- 11 hours on jobs
- 15 hours on extracurricular activity
- 9 hours on dates
- 8 hours on bull sessions
- 8 hours on fraternity, sorority and club activities

Although in college this group has far more important uses for the telephone, they find themselves dropped into a communications vacuum. There are telephones, generally in the hall, for every 20 or 30 students. And although we isolate them for four years as far as communications are concerned, we expect them to take their place in business where the phone has become the major instrument of internal and external communications. Also, this same group makes up our future residence market, and we'd like to see it well schooled in good communications!

The sketches (next page) illustrate what happens in a typical college dor-

mitory when the hall phone rings.

While students are studying, the persistent ringing of a phone certainly isn't much help to them.

However, some hopeful co-ed scurries to answer. But most of the time the call is for somebody else.

And while the called person talks, other students begin to queue up waiting to make a call. This phone will be tied up for the rest of the evening.

Now, if this looks like a problem, imagine the frustrations of people trying to reach a student in this dorm:

Sometimes it's a fellow student who wants to discuss lecture notes.

Or a professor trying to line up an appointment with one of his students.

Or a hopeful college boy trying to line up a date for the big week end. (Educators agree that social life is important at any school.)

Then there's the family calling to find out if everything's all right with their son or daughter at school. (Since they're paying the bills, it would be nice to be able to talk just once in a while.)

Or perhaps it's an employer trying to line up his student help. And all this is expected of one telephone for every 20, 30 or even 40 students. It's no wonder we've had such fads as telephone marathons and students stuffing themselves into phone booths!

On the business or administrative side of the college community, there are also inadequacies. Many schools have an insufficient number of trunk lines coming into the school. Result: people calling the school get excessive busy signals, while PBX attendants fight a losing battle trying to keep up with incoming and outgoing calls.

Communications Confusion

Many campuses unfortunately have separate or satellite systems which add to the communications confusion because it's difficult to reach administrators and faculty members served by these systems. For example: a call placed to a professor of agriculture is first answered by the main PBX operator. The caller may be told to hang up and dial a PBX in the School of Agriculture or is connected via tie line to the PBX serving the School of Agriculture. Finally when he reaches the School of Agriculture, he's connected to the professor's extension, perhaps only to find it's busy or that the professor is out. Slowly but surely, the impression the school gives to outsiders becomes poorer as a result of the slow answers, the busy signals, the confusion and the human failures.

What has happened to make most of our colleges and universities classic examples of poor communications? The answer is that their communications facilities have not kept pace with the institutions' tremendous growth and fast-changing needs. Since 1945, enrollments have increased by 135 per cent, or from 1.7 million to 3.9 million. By 1975, more than seven million students will be enrolled in over 2,000 colleges and universities in the United States. Although enormous amounts have been spent on the most modern and efficient buildings to house and teach these students, most of them are still operating under the handicap of antiquated communications systems.

Today in the Bell System there are more than 700,000 students living in 350,000 dormitory rooms. Talk about a growing market! By 1975 it's estimated that the number of dormitories will double, and every dormitory room is a potential telephone location.

The Solution

The first part of the solution to the college communications problem is a telephone in every dormitory room. Telephones in dormitory rooms will not only benefit students, but also the faculty, administrators and people outside the campus community. Room phones tie the school together as well as providing external communications.

Room phones also eliminate time wasted by students waiting to use the phone as well as the interruptions caused every time the hall phone rings. It further enables them to make appointments, work out problems with fellow students, and coordinate other activities, such as keeping in touch with parents and arranging dates.

The second part of the solution is to make these room telephones part of a completely integrated system serving students, administration and faculty. Campus calls are made by dialing the extension number without going through the board. Outside calls are also made by simply dialing direct, again by-passing the switchboard. This enables the PBX attendant to give more attention to incoming calls.

Centrex

The ideal solution to the large school's communications problems is CENTREX. The in and out dialing features of CENTREX allow the PBX attendant to give complete attention to incoming calls. Another feature, ANI (Automatic Number Identification) simplifies the billing of long distance calls, saving time for the school's accounting office. CENTREX enables the schools to use minimum space, while providing the ultimate in service. Michigan State University already has complete CENTREX service and a number of other colleges will be cut over before the next school year starts. But as yet we've only scratched the surface of this market.

In addition to basic telephone service, other communications needs of colleges and universities can be met by TWX, DATA-PHONE and EDUCATIONAL TELEVISION (ETV.)

TWX service can be used on the administrative side of the school. It is especially valuable in purchasing and in connection with other functions where fast-written communications are needed, such as reference libraries.

DATA-PHONE service has a natural market on the college campus. Data machines, from card readers to elaborate computers, are being used to gather, store and break down information. On the sprawling campuses of many universities DATA-PHONE service will provide easy access to these data machines by various departments as well as branches of these schools located in other towns and cities.

ETV also has an important place in higher education. ETV is not being used to replace the teacher, but rather as a tool to support and assist the teacher's live presentation. It enables an English professor, for example, to enrich a course in literature by showing a particular scene from Shakespeare, while students are reading it.

In this article we have touched very lightly on some of the services that we can offer to educational institutions. The goal is to provide complete, modern communications to meet the needs of colleges and universities.

To help meet this goal, a special marketing program will be made available to the Bell Companies in the first quarter of 1962. Included in this program are a market selection book, special training for their salesmen who work with colleges, visual aids and a film strip for use in making sales presentations.

The needs of this market are great; the services to meet these needs are available. Creative selling by specially trained salesmen will bring complete and modern communications to campuses across the nation.

Who's Who & What's What In This Issue

Allen G. Barry

In "Getting To Know Our Share Owners" (page 2), Allen G. Barry writes from a deep personal conviction of the importance of achieving mutual understanding with those who have an interest in the business. He stresses this point in the article when he says, "The success of our business depends upon the understanding and trust of our share owners just as it does on the understanding and trust of our customers and employees."

As vice president and secretary, Mr. Barry is directly concerned with maintaining good relations with share owners. As he points out in his article, the Share Owner-Management Visits are a recent but valuable addition to the Company's over-all share owner relations program.

Mr. Barry has broad experience to draw upon in his present relationship with shareholders. Most of his Bell System career has been spent in achieving a similar mutual understanding with customers. His first assignment was that of Traffic student with the New York Company beginning shortly after his graduation from Harvard University in 1928. After many different assignments of increasing responsibility in the Traffic, Commercial and Personnel Departments of the New York Company, he transferred to the Wisconsin Telephone Company as vice president—Operations on July 1, 1948. He was vice president and general manager of Michigan Bell when he came to A. T. & T. as vice president on January 1, 1961. He became vice president and secretary last March 21st.

The co-authors of "Electronic Data Processing In The Bell System" (page 10) are responsible for the coordination of A. T. & T.'s activities in the EDP field. Both have been in continual

John E. Kremers

Paul C. Durkee

close touch with the trial installations which they describe in their article. John E. Kremers and his group have been working with the service order, directory and disbursements trial in Boston, while Paul C. Durkee and his organization have had a similar relationship with the billing and collection trial in Conshohocken. Through their combined experience, they are thus able to give us a broad perspective on developments in this extremely significant new field in the Bell System.

Mr. Kremers began his Bell System career with the Wisconsin Telephone Company in 1948 after graduating from Iowa State University with a BS degree in electrical engineering. After various positions in the Plant, Commercial and Accounting Departments, he was appointed general accounting personnel supervisor with responsibilities for both personnel and methods. In this assignment he worked with accounting and interdepartmental mechanization projects. He came to his present post of general accountant for A. T. & T. in August 1961.

Mr. Durkee's first Bell System assignment was in the Accounting Department of the New York Company in 1928 after graduating from the University of Rochester as a mathematics major. This is his third tour at A. T. & T. headquarters. In between assignments at "195" he served as auditor of receipts for the Pacific Company in southern California and general accounting manager for Oregon. Prior to his current asignment, he was general accounting manager of the Upstate Territory of the New York Co.

JAMES G. BLAKE the author of "What Has W. E. Been Doing Lately?" (page 21) has been with Western's Electric's public relations organization for the past ten years, the greater part of it having been spent in advertising. Other assignments have included employee information work and supervision of "Western Electric News," a feature syndicate for Bell System editors. For

the past three years, Mr. Blake has been editor of Western Electric's national publication, *WE*.

Before joining the Bell System, he worked on daily newspapers in the East and with the New York Bureau of the United Press Association. Following wartime service as a public relations and information specialist with the Air Force in Europe, he became an associate editor of the magazine *Medical Economics* and later was a free lance in business journalism.

James G. Blake

As PLANT CUSTOMER services administrator, G. Robert Knell works with the Companies on problems associated with the installation and maintenance of telephone equipment on customers' premises. In fact, his responsibilities have been in this same general area since he joined the A. T. & T. Department of Operation and Engineering in 1952. Thus his interesting and authoritative discussion of the new, customer-oriented measurements of quality in installation and repair work (page 36) was written from wide experience.

Mr. Knell began his Bell System career in the Long Island Area of the New York Company in 1929. Various assignments in the Commercial, Engineering and Plant Departments followed. After service in the U. S. Navy from 1943 to 1946 he returned to the Engineering Department of the New York Company. In 1950 he became district Plant superintendent for Staten Island and the following year he was appointed division Plant superintendent for North Brooklyn—the post he held when he transferred to the O. and E. Department of A. T. & T. in 1952.

G. Robert Knell

THE AUTHOR of "SCAN — A New Communications System for The Military" (page 50) was graduated from Indiana University with a Bachelor of Science degree in 1944. After serving in the U. S. Army in the Pacific Theater in World War II, he joined the A. T. & T. Long Lines Commercial Depart-

Robert E. Gradle

ment as a service representative in Chicago in 1947. He later worked in the Long Lines Plant and Accounting Departments at Chesterton, Ind., Chicago and New York and then was transferred to the A. T. & T. Treasury Department as staff assistant. In 1953 he returned to Long Lines and later had three assignments in the Commercial organization, the last as government communications manager in Washington. In July 1959 he became division plant superintendent at Springfield, Mass., and in February 1960 he was appointed to his present position as general manager—government communications.

Mr. Gradle is a member of the Association of the U. S. Army, the Air Force Association, the Navy League and the Armed Forces Communications and Electronics Association.

THE obvious enthusiasm with which "Communications Unlimited for Colleges and Universities" (page 54) was written stems from the author's recent and extensive first hand experience with his subject. In the last few months he has visited many of the colleges in the Big Ten and Mountain States, as well as Eastern schools, and has seen "the worst and the best" in school telephone systems. Meeting with Housing Officers all over the country, he finds that they are vitally interested in obtaining complete communications conveniences. He is now preparing a marketing program for colleges and universities which will offer solutions to many of their current communications problems. The program will be available to the Companies soon.

Mr. Barry began his Bell System career, after graduating from Brown University, as a commercial representative with the Southern New England Company. Since then he has been an office manager, a sales manager and has held other supervisory positions. Most recently he worked in Marketing handling sales promotion and training. He came to A. T. & T. in 1961 where he is now a marketing representative.

Edward J. Barry, Jr.

In The News

- *"Seeing Aid"*
- *DEW East*
- *ETV Tariff in Effect*
- *TL Microwave*
- *Magnetic Drum Dialer*
- *Anatomy of an Accident*

A new aid for blind PBX attendants will enable them to "see" the switchboard with their ears instead of their eyes. Developed by Bell Telephone Laboratories, it will be available in the first quarter of 1962. This "Seeing Aid" consists of a probe (equipped with a photo-transistor for detecting lamp signals) attached to a cord reel, a transistor oscillator (which produces a tone in the attendant's headset when the probe passes a lighted lamp) and a "sectionalizer."

The "sectionalizer" is a vertically mounted strip containing a pilot lamp for each strip of jacks or cord circuits. Located on the face of the board, it enables the blind attendant to distinguish between station, trunk and cord supervisory signals.

Upon hearing an audible signal, the blind attendant runs the probe vertically over the "sectionalizer" pilot lamps. When the probe passes a lighted lamp, a tone in the attendant's headset indicates which of the horizontal strips contains the individual signal. The attendant then passes the probe horizontally over the proper strip of trunk or station lamps (or along the cord circuit lamps) until a second tone is heard which indicates the proper jack or cord.

Earlier switchboards designed for sightless operators used Braille markings. The new model is the first to use audio signals in the operator's earphones.

The equipment is simple to operate and relatively inexpensive. Indications are that it will stimulate interest in the use of blind people as PBX attendants.

New aid for blind PBX attendants.

Seven radar detection and communications stations that form a 1200-mile eastern extension of the Distant Early Warning (DEW) Line were recently completed and turned over to the Air Force by Western Electric.

The new segment, known as DEW East, extends the air defense warning network against attack by manned aircraft along a frontier that runs from Baffin Island in Canada, across Greenland to the western coast of Iceland. It spans two

large water areas – Davis Strait, separating Canada and Greenland, and the Denmark Strait, which lies between Greenland and Iceland.

The extension greatly reduces the possibility of an enemy "end run" around the main DEW Line, which stretches nearly 5000 miles from the Aleutian Islands across northern Alaska and Canada. The entire DEW system now covers some 6000 route miles.

In announcing the operational readiness of DEW East, the Air Force stressed that enemy manned bombers still pose a threat to North America and will continue to do so for many years. For that reason, the Air Force said, detection networks are needed which will give warning of impending attacks from both aircraft and ICBMs.

Western Electric, as prime industrial contractor, has been responsible for the design, engineering and installation of electronics and communications systems for DEW East. Building design and construction was handled by the Army Corps of Engineers. The Air Force will operate the network.

At the end of October, Western Electric turned over to the Air Force a new communications system to support radar detection facilities along the Aleutians' outer reaches. Engineered, installed and tested by Western, the system consists of three "over-the-horizon" radio relay stations on Shemya and Adak islands, and at Nikolski on Umnak Island, all tiny outposts located at the far western end of the Aleutians. The three stations are linked by rearward radio circuits to existing DEW Line installations in the Aleutians, previously completed for the Air Force by Western Electric.

East and West. Left above shows a Greenland site on the DEW East extension of the Distant Early Warning Line. At right is view of Aleutian Island link to DEW Line.

A plan to furnish channels for educational television service was outlined in a tariff—filed with the Federal Communications Commission by the Long Lines Department of A. T. & T. for the Bell System—that became effective on December 7. This service was developed to meet the growing requirements of public and private schools, non-commercial educational television broadcasting stations and other non-commercial educational organizations for the transmission of educational television program material.

The tariff provides for both local and inter-exchange service — each being offered for 24 hours a day, seven days a week. The local plan is for use by one or more school systems within 25 miles of the television signal source. As many as six channels are provided.

Under the inter-exchange plan, which has a capacity of five channels, locations more than 25 miles from the signal source could be interconnected. The offering was designed to aid educational institutions such as local school districts or colleges in developing their own ETV programs or, if they wish, in joining other groups in common programming.

The tariff offers interstate channels for educational TV at rates significantly lower than those for commercial television. The lower cost of ETV service is possible because, under this offering, channels are furnished directly between premises of the customer, and there is no provision for such items as supervision, switching and standby circuits which are important in commercial broadcasting.

The Bell System is already experienced in ETV. The Southern Bell Company provides service in South Carolina for a statewide system serving 67 schools in 21 counties. In Hagerstown, Md., the Chesapeake and Potomac Company provides service to 44 schools in the Washington County school system.

Effective January 18, that portion of the new tariff covering inter-city channels was modified to permit industrial organizations and other users employing educational television to take advantage of this offering.

A new, low-cost radio relay system for transmitting voice, data and teletypewriter signals over short routes is now being readied by Western Electric for its Bell System debut. Called TL Microwave, the new development will serve the telephone companies growing need for more economical message transmission over distances up to 200 miles.

The first TL installation, made by W.E. and now being installed by the Mountain States Telephone & Telegraph Company,

First TL Microwave cabinet assembly on its way to the shipping area at W. E. plant.

will provide a new communications link between Hardin and Billings, Montana. Additional TL systems are scheduled for installation by Western Electric in other telephone company areas in the near future.

TL Microwave has been designed to provide the telephone companies with a radio relay system competitive in cost with cable or open wire wherever requirements are as low as 25 to 50 circuits. At the same time, TL's maximum circuit capacity – up to 180 simultaneous telephone conversations or many one-way data transmissions–is high enough to accommodate growth for many years into the future.

Special features of the TL system are its flexibility in use and its relatively small power requirements. It is expected to find wide application in situations where open-wire or cable lines are economically impractical – thus overcoming problems caused by difficult terrain or the need to secure rights-of-way. Its compact design permits TL stations to be installed near sources of commercial power and along roads where existing utility rights-of-way have been established. Its low power requirements–made possible by the almost exclusive use of semiconductors in equipment design–enable the TL system to operate on regular storage batteries kept continuously charged by commercial power. (If commercial power fails, the batteries can sustain operations for more than 20 hours).

A telephone on which 50 frequently called numbers can be recorded and automatically dialed is now undergoing field tests in Buffalo, New York. Called the Integrated Magnetic Drum Dialer, the new device was conceived and developed by Bell Laboratories. The trial models were produced in Western Electric's Model Shop at the Indianapolis Works and delivered to the New York Telephone Company for the test.

The new telephone combines the features of a standard six-button key set with a number recorder and dialing mechanism

Magnetic Drum Dialer telephone.

–all within one compact housing. This design allows the subscriber to record up to 50 telephone numbers on a magnetic drum. Each space on the drum can accommodate up to 14 digits, thereby providing for Direct Distance and Inward Dialing Services.

The names and numbers of each recorded party may be written on the built-in directory for easy reference. In addition to automatic calling, the customer may dial numbers manually.

The safe-driving film titled "Anatomy of an Accident" has been completed, and preview prints have been sent to the Companies. This sound-color film, with David Wayne and Phyllis Avery, illustrates the vital principles of safe driving. It shows how the lack of these principles contributed to a fatal accident involving a tele-

phone man and his family. The safety message is brought out through psychological impact rather than horror scenes.

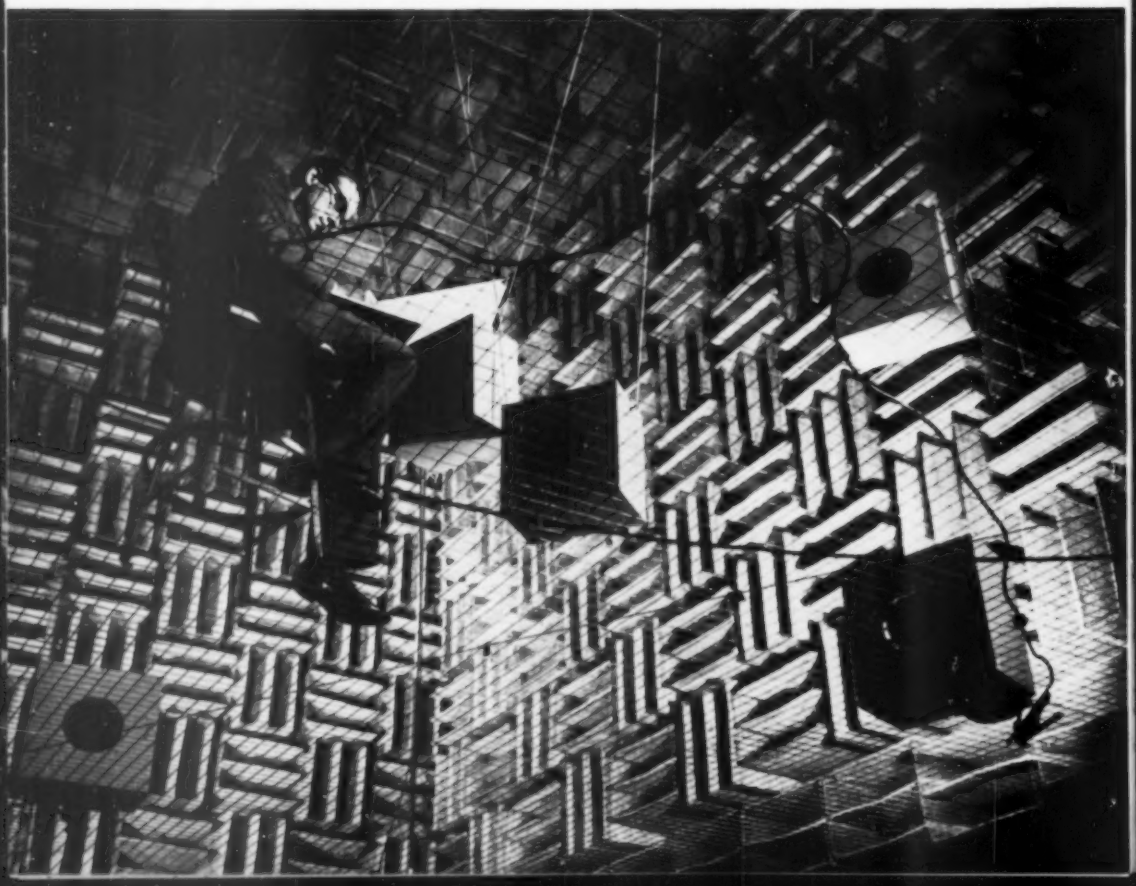
Early showing of the film to employee groups has been recommended. "Anatomy of an Accident" should also be important in the area of public service for community safety programs. The high caliber of the film should make it readily acceptable for TV and theater use, and it is being made available for these purposes. It is also being made available for showings to civic groups, service clubs, P.T.A.s, etc.

A scientist from Bell Telephone Laboratories recently told the Acoustical Society of America that he's been listening to speech and music in auditoriums and concert halls that don't exist.

Dr. Manfred R. Schroeder hasn't been hearing imaginary sounds, however. As head of an acoustics research group at Bell Labs in Murray Hill, N. J., he's been doing experiments with an electronic computer. He's been using it to simulate what happens to sound waves when they bounce back and forth in imaginary rooms. He described his work at an Acoutical Society meeting in Cincinnati, Ohio.

With Dr. Schroeder's method, rooms can be evaluated before actual construction has started; modifications in the design can be studied, and a final satisfactory architectural plan can be adopted. This new approach to the design of concert halls will give considerable aid to the architectural acoustician who is faced with the complex problem of designing auditoriums for very large audiences.

In "anechoic" (echo-free) chamber at Bell Laboratories Dr. Schroeder listens to music in "imaginary" auditorium.



New DATA-PHONE *set.*

Data-phone sets which combine the elements of a telephone and a data set in a single compact housing are now in production at Western Electric. They were first introduced to the assembly line in early October.

The new models have two-tone gray housings and come in three basic sizes to fulfill a wide range of communication requirements for business customers of DATA-PHONE service.

First introduced by the Bell System in 1958, DATA-PHONE service permits electronic computers and many other types of business machines to "talk" to each other over regular telephone circuits. The versatile service accommodates data transmissions in any machine language – including digital data, words, figures, handwriting, drawings, charts, photographs and mechanical instructions–to and from any place in the country where there is a telephone. It will handle such transmissions at controlled speeds ranging from 100 to 2600 words per minute.

The new DATA-PHONE sets will reduce the need for separate pieces of apparatus on the customer's premises since their design integrates the telephone and data circuits into a single unit of modern, compact design.

A report, "Promoting the Residence Market," has been developed to help evaluate marketing activities in the residence field. It shows, by companies and areas, comparative data on the number of residence extensions in relation to main telephones and on the increase in this relationship, Princess telephones, Bell chimes, Home Interphone and residence individual line service.

Sales results alone are not a sufficient test of the sales job; this new comparative measurement is designed to reflect the desired basic revenue increase and single out the parts of promotional programs and sales efforts which need greater emphasis. As such, the new quarterly report is expected to be a valuable supplement to sales reports as an aid in managing and directing sales efforts.

A growing number of new ships for the U. S. Navy are being equipped with electronic weapons-direction equipment made by Western Electric. Such equipment, developed by Bell Laboratories, makes air defense a semi-automatic function aboard ship. Under central electronic command it unifies the defensive operations of the vessel's radars, antiaircraft guns and guided missiles.

Many of the first guided missile destroyers to join the Navy's fleet–including the *U.S.S. Charles F. Adams* and *U.S.S. John King* which were commissioned in 1960–are armed with Tartar surface-to-air missiles and W. E.'s weapons-direction equipment called "Mark 1." The *U.S.S. Berkeley*, a sister ship launched in July 1961, also will carry Tartar missiles and "Mark 1" equipment.

Another new ship being built for the Navy is the nuclear powered frigate *U.S.S. Bainbridge*, launched in April 1961. This

USS John King, *one of the first guided missile destroyers is armed with Tartar missiles and uses W. E. weapons direction equipment.*

vessel will be armed with Terrier guided missiles and use W. E.'s "Mark 4" weapons-direction equipment. Similar Western Electric electronic systems are already in service on U. S. cruisers, frigates and aircraft carriers.

Worth Reading

"Mrs. Bell was as great a woman as Dr. Bell was a man. Despite her deafness she was exceedingly well informed on scientific matters. And, although history hasn't paid much attention to the fact, her creative talents seemed scarcely less brilliant than Bell's himself."

This neglect, described by Dr. Gilbert Grosvenor, Professor Bell's son-in-law, is remedied in a new book by Helen Waite, *Make A Joyful Sound*, the personal story of Dr. and Mrs. Bell.

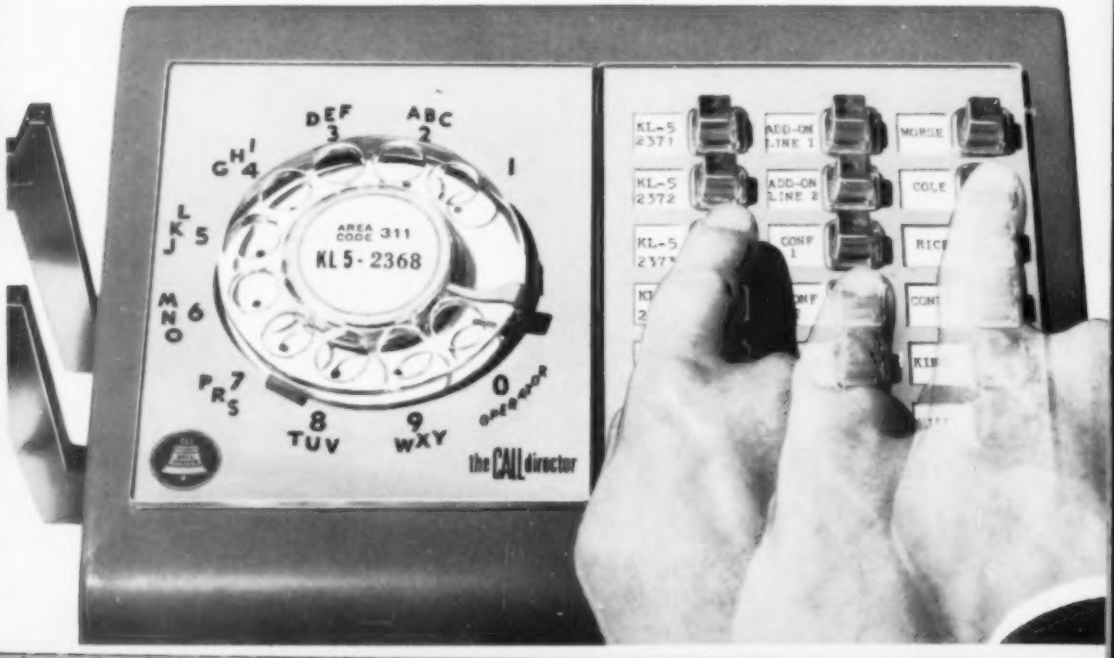
In this first authorized biography of the pair, Miss Waite tells of Dr. Bell's career, his family life, his imaginative work in many fields and the remarkable woman who stood beside him. It is based on official records, reminiscences of Bell descendants and upon family papers never before made available to a biographer.

This warm, personal study, illustrated with rare photographs is a welcome addition to the limited material available on the personal lives of this unusual couple. The biography is published by the Macrae Smith Company of Philadelphia. *L. S. G.*

It's almost easier to list what it CAN'T do

There's hardly *any* function of your office communications that the Bell System CALL DIRECTOR telephone can't handle.

It serves as a regular office phone, of course. But it does *extra* duty, too, as a push-button intercom. It lets you "hold" calls while you make others . . . add other phones in your office to outside calls . . . set up conference calls. And if your line is "busy" when a call comes in, the CALL DIRECTOR telephone connects you automatically the moment your line is free.

The CALL DIRECTOR telephone is serving thousands of business firms profitably. And it's just one of many new and versatile Bell System services now available. One of our Communications Consultants will bring you the whole story—without obligation. Just call your Bell Telephone Business Office.

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